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ALASKA AGRICULTURAL EXPERIMENT STATIONS.

C. C. GEORGESON, Agronomist in Charge.

REPORT OF
THE ALASKA AGRICULTURAL
EXPERIMENT STATIONS.
1916.

UNDER THE SUPERVISION OF
STATES RELATIONS SERVICE,
Office of Experiment Stations,
U. S. DEPARTMENT OF AGRICULTURE.

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1918

ALASKA AGRICULTURAL EXPERIMENT STATIONS, SITKA, KODIAK, RAMPART, FAIRBANKS, AND MATANUSKA.

[Under the supervision of A. C. TRUE, Director of the States Relations Service, United States Department of Agriculture.]

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LETTER OF TRANSMITTAL.

ALASKA AGRICULTURAL EXPERIMENT STATIONS,
Sitka, Alaska, May 29, 1917.

SIR: I have the honor to submit herewith a report of the work of the Alaska Agricultural Experiment Stations, 1916.

Very respectfully,

C. C. GEORGESON,
Agronomist in Charge.

Dr. A. C. TRUE,
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Publication recommended.

A. C. TRUE, *Director.*

Publication authorized.

D. F. HOUSTON, *Secretary of Agriculture.*

¹ Appointed Apr. 1, 1917.

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REPORT OF THE ALASKA AGRICULTURAL EXPERIMENT STATIONS, 1916.

SUMMARY OF WORK AT THE STATIONS.

By C. C. GEORGESON, *Agronomist in Charge.*

GENERAL VIEW OF THE SITUATION.

The experiment stations of Alaska are conducted for the purpose of learning what the agricultural capacities of the Territory are. Alaska is a vast country with very diverse geophysical configurations. As a direct consequence the normal climate varies greatly in different regions of the Territory. Generally speaking, there are two climatic belts, namely, the coast region, or the belt skirting the ocean, and the interior, which is the vast area that lies northward of the coast range. The belts again vary in climate. Some sections of the coast region have three times the amount of rainfall of other sections. In the interior are many valleys which again differ from each other in climatic conditions. It is by reason of this diversity in climate that it is necessary to maintain so many experiment stations, for no two sections are alike in this respect. In these far northern latitudes the farmer is at the mercy of the weather to a greater extent than he is in the States. During a year with a large percentage of rainy days and overcast skies farming is precarious. During a year such as 1915, when the summer gives more than the usual amount of sunshine and warmth, farming is a success. Here on the border line of possibilities weather conditions determine the success or failure of the crops. It is for this reason that these reports are so full of data on the weather and that reference to weather conditions may appear to cumber the text unduly. Every settler in Alaska must learn to adjust his work to climatic conditions as he finds them.

The map attached hereto gives a general outline of the agricultural areas. (Pl. XIII, p. 72.) From the latitudes and longitudes the reader can judge of the normal temperature and precipitation, for which see page 85.

SITKA STATION.

The unfavorable climatic conditions repeatedly referred to in this report affected the Sitka Station, as also every section of the Territory. But the work of the farmer and gardener in the coast region

suffered more from the cold, wet summer than did similar work in the interior. The coast region is always more cloudy and rainy than is the mainland beyond the coast range.

THE ORCHARD.

Apples.—The orchard produced practically no ripe fruit in 1916. Such varieties of apples as the Yellow Transparent and Livland (Lowland) Raspberry, which in normal summers have matured fruit, produced only small, imperfect apples that would not grade above culls. Two dwarf trees of an English variety, Keswick (Keswick's Codlin), set a number of apples, but as unfortunately they and many others were stripped off the trees by Indian boys before they ripened it was impossible to judge their quality.

Cherries.—The small cherry orchard bore a little fruit, the best being Richmond (Early Richmond) and Morello (English Morello), but these also were imperfect, most of the cherries that reached normal development cracking open and beginning to rot before they were fairly ripe. Owing to the fact that no fruit matured, the hybridization experiments were failures.

BUSH FRUIT.

Currants, gooseberries, and raspberries did fairly well. The yield was light for all three, but they suffered less from the cloudy, wet weather than did the larger fruit. Toward the end of the summer the raspberries, which are always late here, mildewed and rotted on the canes to a large extent as soon as they were fairly ripe. It should be noted that the growth of all sorts of fruit bushes was quite vigorous.

HYBRID STRAWBERRIES.

All strawberries suffered from the weather conditions, practically none of the berries drying out and most beginning to rot on the plants as soon as they approached maturity. Some good berries were produced, but they could not be shipped because the wet weather had caused them to be too soft, and those that were sold were disposed of in the local market. Some 1,500 new seedlings, produced from 1915 crosses, were planted in the open. As they did not bear fruit their value can not be ascertained until 1917 or 1918, or when they show their first fruit. Of the large number of hybrid plants which bore fruit for the first time in 1916, there was only one plant that gave promise of superior merit. Its berries were large, deep red in color throughout, very firm, and of excellent flavor. This is a cross between the Magoon and the native berry of the interior. It remains to be seen if it will retain its promising qualities under cultural conditions.

THE NURSERY.

Several hundred apple grafts were made as usual to be distributed to settlers for testing in other sections of the Territory. Many hundred cuttings of currants, raspberries, and gooseberries were used for the same purpose, as also the offspring from old plants which had been set out and raised. These all did fairly well, and a goodly stock of plants is on hand for distribution in the spring of 1917.

DISTRIBUTION OF NURSERY STOCK.

It has been the custom of the station for several years to send out a few small apple trees, a few plants each of currants, gooseberries, and raspberries, and some *Rosa rugosa* and Tartarian honeysuckle to settlers who ask for them. It is difficult to send living plants to the interior or to the far west, because the packages are on the way such a long time that the plants are usually dead on arrival. As packages can not be sent to the interior until river navigation opens in June, the plants sent out do not reach their destination until July; and it takes almost as long to send plants to the west beyond Kodiak, there being but one mail a month to that section of the country. The service to the interior will doubtless be vastly improved when the railroad is completed to Fairbanks, which it is hoped will be within two years. In the spring of 1916, 217 orders for nursery stock were filled and sent to as many different addresses.

Although it is understood that the recipients of nursery stock are to report concerning the behavior of these plants in their new environment, a majority of them never take the trouble to do so. The general tenor of the reports received, however, is that currants, gooseberries, and raspberries do well everywhere in the interior and in the coast region; and that apples live, but make only slight progress toward becoming trees. Only a few apples have been planted long enough to bear fruit, and these few are in the neighborhood of Juneau. Apples mature every year at Haines, some maturing there even last year, and some also at Juneau, Wrangell, and southward to the southern boundary of the Territory. There is considerable doubt as to the possibility of raising apples at all in the interior or of obtaining much success with even the earliest varieties in the coast region west of Sitka. This is an excellent climate for berry growing, but no tree fruits of the kinds now in existence give promise of excellence anywhere in Alaska, since they do only moderately well in such favored localities as warm, sheltered spots in southeastern Alaska.

It appears that if apples are ever to be made a success in Alaska they must be developed from hybrids between hardy, early maturing varieties of the Northern States and the native crab indigenous to the

Alaska coast region. The latter (*Pyrus diversifolia*) differs so radically from the cultivated apple that successful crossing may not be possible. The apples, no larger than small beans, grow in clusters of from three to seven or eight. They make a tart but delicious apple jelly, but they have no value for any other purpose. The native crab is successfully used as a stock on which to graft other varieties. Every year since the orchard trees began to bloom crossings have been made between the native wild crab and the varieties in the orchard, chiefly the Yellow Transparent. Some seedlings have been raised, but from the evidence of their growth and foliage they resemble the wild crab too closely to be very promising. Some of them will, however, be grafted into larger trees to hasten fruit production.

A few years ago a dozen hybrid apple trees, which had been produced by Dr. W. T. Macoun, of the Central Experiment Farm at Ottawa, Canada, were obtained from the director of that station, but they did not do well here and they are now all dead.

All varieties of currants and gooseberries which have been sent out apparently do equally well, but this is not true of the raspberries. While they all live and fruit, the Cuthbert is far better than any other tried.

POTATOES.

Some 50 varieties of potatoes were grown at the station last year. Owing to the wet season all produced lush tops, but the yield and quality of tubers were inferior to those of the 1915 crop, none of them making the dry, mealy tubers that the market demands. The potatoes at all the stations are sprouted before they are planted—that is, they are placed in a warm room in shallow boxes three weeks or a month before planting, or until the potatoes have green sprouts from 1 to 2 or more inches long, when they are cut into two or three pieces or sometimes left whole, and planted with the sprouts just reaching the surface of the soil. Some time is gained by this method, and the crop is more certain of maturing than it is when grown from unsprouted tubers.

Seedling potatoes.—A few potatoes matured seed balls last year. These were Keeper, Green Mountain, and Norway No. 1 (a variety without name obtained direct from Norway some years ago). As the blossoms from which these seed balls developed had not been hand pollinated, only chance crossing, if any, could have occurred. The seeds were sown in flats in the middle of May, 1916, and some 600 of the resulting plants were set in the open in the first half of July. The growth was quite rapid, some of the plants even reaching the blooming stage before they were dug (from Sept. 30 to Oct. 13). Of course, the potatoes were small, many of them no larger than hazelnuts, and it is impossible to judge of their value until they have been grown for at least one more year.

OTHER VEGETABLES.

The usual hardy vegetables were grown on a very small scale, none of them proving a decided success with perhaps the exception of radish, turnip, and lettuce, while cabbage and cauliflower were much inferior to the same crops in 1915. Root maggots proved very destructive. Tar-paper shields, put around the plants soon after they were set out, afforded some protection, but in spite of these many of the plants were attacked. Root maggots are a pest all over the Territory. No section appears to be exempt, though the degree of severity varies, being least in southeastern Alaska. So far no practical remedy has been discovered, as chemical applications strong enough to kill the larvæ, or prevent their appearance, are also injurious to the plants. Common vegetables, as kale, Brussels sprouts, carrots, parsnips, parsley, onion sets, radishes, lettuce, turnips, and rutabagas, were grown merely for samples. The climatic conditions prevented normal development, and comparative tests of varieties proved to be of no value.

ORNAMENTALS.

The station is making an effort to obtain and propagate all sorts of ornamental bushes and plants that give any promise of thriving in Alaska. Of all so far tried, none has proved a more genuine acquisition than *Rosa rugosa*. At Rampart, it is hardy without special protection. A number of seedlings are grown, the seed having been for the most part gathered from bushes now growing at the station. While this rose may not be considered of much value elsewhere, it is a great addition in Alaska, where few of the common ornamentals thrive. The blossoms are single and last but a couple of weeks, but they are large, very fragrant, and of various shades of rose and red, being succeeded by a very large, bright red rose hip. The rose is difficult to propagate in the open, as it will not grow from cuttings except in the propagating house, where they can be supplied with heat. A couple of plants have been obtained of a variety having large double flowers which last from three to four weeks on the bushes and which in addition are fully as fragrant as the single blossoms. These are being propagated under glass with considerable success.

The Tartarian honeysuckle is another ornamental that is an entire success in the coast region of Alaska. It is not showy, but it is loaded with pink blossoms about the middle of the summer, making a pleasing addition to the prevailing dark green landscape, which takes its tone from the ever present spruce. This honeysuckle can be propagated quite readily from cuttings.

There is a long list of hardy perennial flowers that do well in the coast region of Alaska, the Oriental poppy (*Papaver orientale*) easily standing at the head of the list, and nothing can be more bril-

liant than a mass of these plants in full bloom about the middle of July. The flowers are very large, of varying shades of red, with rose and scarlet prevailing. Several varieties of perennial phlox and several spireas are also noted acquisitions to the plants that do well here. Peonies will thrive only in warm sheltered spots. These are only a few of the leading sorts among many that can be grown. All the hardy and half-hardy annual flowers do well in Alaska, but members of this group, such as stocks and asters, must be raised under glass and planted out when the weather gets warm. The finest of sweet peas have been grown at the Fairbanks Station.

THE PROPAGATING HOUSE.

The new propagating house is an unqualified success, permitting much work to be carried on that could not be done without it. The chief reason for securing the house was to propagate economic plants which have to be rooted under glass, but since this work is not carried on at all times throughout the year, many flowering plants are grown, when space for propagation of economic plants is not needed, for the purpose of proving the possibilities for florists in Alaska. Mr. C. H. Benson, who has charge of this work, has grown as fine chrysanthemums as can be seen in the Japanese Imperial Gardens. He also grows carnations successfully, and nothing can surpass his winter-blooming cinerarias, sweet peas, and calceolarias. Plate I shows a view of the house as it appears in late winter.

KODIAK STATION.

A detailed account of the operations at Kodiak Station for the season of 1916 is given in the report of the superintendent, M. D. Snodgrass, page 53. Only matters calling for special emphasis or those not discussed in the fuller report are taken up here.

In spite of the unfavorable weather conditions caused by a very late spring and cold, wet summer, enough hay and silage was produced to carry the herd through the winter. Grain can be matured at Kodiak only in very favorable seasons when early varieties of barley and oats ripen, but even when these ripen there are ten chances to one that rain will prevent harvesting and saving the crops. Hence no serious attempts have been made to grow grain except for hay and silage. Moreover, not enough land is as yet under cultivation to permit experimentation in this line, as the available land must be used for hay crops. What grain feed is needed for the herd, approximately 10 tons annually, is therefore purchased in the open market, aside from which the herd is maintained wholly on native products, chiefly wild grass. There is plenty of pasture all over the country, but stock raisers who settle on Kodiak Island, or

anywhere else in the coast region, should make sure that there is sufficient grass land within easy reach to furnish the hay and silage needed. It is a rough country, and level land on which mowers can be operated is not plentiful. After selecting a location, settlers should come in in the spring or early summer, in order to have time to study the situation and lay plans for securing enough hay and silage for winter feed. More than one settler has met with disaster because these points were overlooked. Some winters are so mild that stock can browse a large part of the time, but this is not to be counted on and provision must be made for enough winter feed to carry the herd from November until the middle of May.

VALUABLE NATIVE GRASSES.

Two species of the native grasses deserve special attention. One is beach rye or beach grass (*Elymus mollis*), a very coarse, vigorous grass, which grows along the salt-water beaches close enough to the water to be inundated only by the very highest tides, which occur once or twice a year. A perennial grass, it propagates and continually renews itself by rootstocks which creep along just under the surface of the ground. It attains a height of about 4 feet, has broad bluish-green leaves, and a seed head which somewhat resembles wheat. It is, therefore, commonly called wild wheat or beach rye. Although it is neither a wheat nor a rye, the term "beach rye" is the best common name. (See Pl. II, fig. 1.) This grass is too succulent to cure well for hay, but it makes the best possible material for silage. The settler in the coast region who can include 20 or 30 acres of this grass in his homestead is in luck, but it must be cared for almost like a cultivated crop. It should not be cut for hay or silage more than two years in succession, and it is still better to cut only every other year, as the grass must have a period in which to recuperate. Cattle should not be allowed to graze on beach rye in the early spring if it is to be cut for silage, since pasturing at that season will weaken the growth and greatly reduce the yield. A good, thick stand may yield as much as 6 tons of silage to the acre or even more. Beach rye is regarded as fully equal to green oats for silage, and a patch of it is well worth protecting. It has never been observed far from salt water. The grass can be propagated by digging up turf, where it is thick, and transplanting on a gravelly beach where it has not already become established. The transfer should be made without shaking the soil from the roots, and care should be taken that the roots do not dry out.

Another grass, which is chiefly used for hay but which can also be used for silage, is the native bluetop (*Calamagrostis langsdorfi* and related species). (Pl. II, fig. 2.) This grass is very commonly, but

erroneously, called redtop. Redtop is a species of tame grass much cultivated on wet lands in southern latitudes only, while this native bluetop grows in moist soil nearly everywhere in Alaska, its universal occurrence making it the most important native grass of the Territory. Its vigor depends on the soil and situation; its height ranges from 2 to 6 feet or even more. This is the grass depended on for hay, and in a large measure also for silage. It is comparatively easy to cure because of its slender stems and thin leaves. Stock feeders sometimes complain that the Alaska grass has no nutriment in it and that their stock can barely keep alive on the hay made from it. Any foundation whatever for this complaint is to be found in the fact that the grass is cut too late in the season. To put off hay making as long as grass is growing is a mistake. Cut just as it is heading out, bluetop makes an excellent quality of hay, even though the bulk will not be so great as it will if cut late. If left to grow, bluetop develops a tall feathery panicle, which produces seeds sparingly, but this top is formed at the expense of the leaves, the lower leaves turning yellow and withering and the stem becoming woody and hard. Hay made at this stage is inferior in value to hay made a month earlier. Bluetop can not be cut oftener than every other year without greatly diminishing the yield.

Analyses by the Bureau of Chemistry of the Department ¹ of bluetop hay, beach rye hay, and beach rye silage are given in the following table:

Composition of Alaskan forage crops.

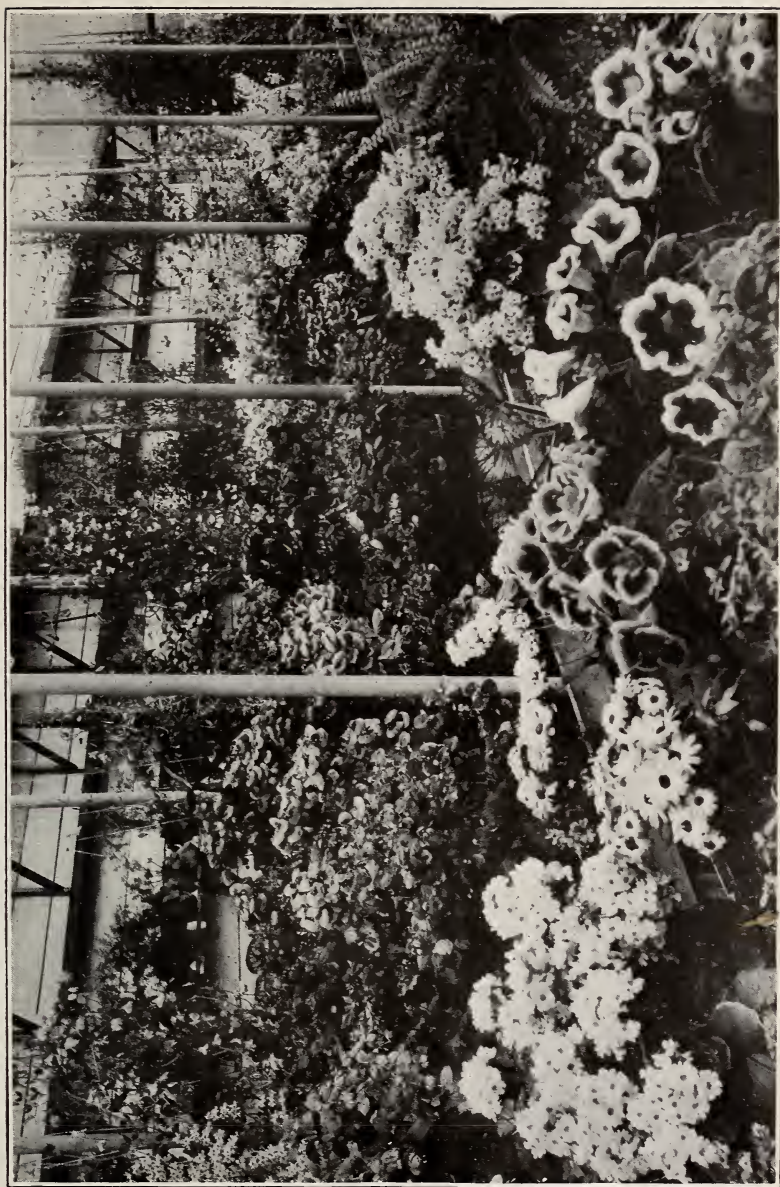
	Moisture.	Ash.	Fat.	Crude fiber.	Protein.	Nitrogen-free extract.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Bluetop hay.....	7.18	3.90	1.03	42.94	4.58	40.37
Beach rye hay.....	11.92	7.51	2.26	30.31	12.71	35.29
Beach rye silage.....	69.77	6.89	3.32	34.64	10.64	44.51

Attention is called to the fact that the protein is the most valuable nutrient in these grasses, and it will be noticed that this ingredient is very high in the beach rye, both as hay and as silage.

THE HERD.

Galloways suited to the climate.—The outstanding fact concerning experiments at Kodiak is that Galloway cattle have proved themselves well adapted to the climate. They thrive well on the native grasses, they are good rustlers, they are hardy, they breed freely, and as beef cattle they are in every way desirable for Alaska. Their chief fault is that they are poor milkers. Occasionally a cow is found

¹ Alaska Stas. Rpt. 1904, pp. 276, 285.



PORTION OF INTERIOR OF PROPAGATING HOUSE, SITKA STATION.



FIG. 1.—CUTTING A GOOD STAND OF BEACH RYE ON KODIAK ISLAND.



FIG. 2.—CUTTING BLUETOP, ALASKA'S BEST NATIVE HAY GRASS, ON KODIAK ISLAND.

that gives a fair amount of milk, but not more than one in ten can be classed as a milker. It was planned to develop the milking quality of the Galloways so that this breed could better meet the requirements of Alaskan settlers, all of whom call for good family cows. An effort along this line was the purchase, in 1912, of 11 head of Galloway cows of fair milking quality from various herds in the States. The experiment was interrupted by the volcanic ash fall, after which the herd had to be kept in the State of Washington for two years, when the pastures were partially restored. While it is believed that a milking strain of Galloways can be developed, it has also become plain that it will take a very long time to do it. To shorten the process, therefore, it has been decided to introduce Holstein-Friesians and make reciprocal crosses between these and the Galloways. From the crossbred offspring, selections will be made of good milking individuals showing the desirable qualities of the Galloway, and this type will be adhered to as far as practicable, with a view to developing a special breed of hardy, dual-purpose animals. The ideal animal should have a large frame, good bone, heavy coat of hair, prevailing black color, and no horns, and should retain the gentleness and the milking qualities of the Holstein-Friesians.

The purchase of Holsteins.—The following Holstein cattle were purchased in the summer of 1916:

Chimacum Sir Quirinus Cornucopia-----	No. 176468 H. F. H. B.
Cascade Betsey -----	No. 154663 H. F. H. B.
Cascade Betsey II-----	No. 260870 H. F. H. B.
Grandview Fayne Piebe Johanna-----	No. 233446 H. F. H. B.
Miss Gladys Cornucopia -----	No. 336455 H. F. H. B.
Gladys Mercedes Banks-----	No. 336456 H. F. H. B.

The first-named animal, the bull that is to head the herd, was purchased from William Bishop, of Chimacum, Wash., being of an exceptionally fine ancestry. His dam was under a year's test at the time of his purchase. The test has since been completed, showing the production of more than 31,000 pounds of milk and more than 1,000 pounds of butter in the year. Cascade Betsey and her daughter, Cascade Betsey II, were purchased from William Todd & Sons, North Yakima, Wash. Grandview Fayne was purchased from W. W. Butler, of Grandview, Wash., and the two heifers, Miss Gladys and Gladys Mercedes, from Mr. Charles Eldridge, Chimacum, Wash. All these animals have been tested for tuberculosis.

Trouble with tuberculosis.—During the summer of 1916 it was found that tuberculosis had developed in the herd. How it happened is unknown. All the cattle originally purchased had been tested for this disease before they were shipped and had appeared sound. In December, 1913, some 60 head were sold at auction at Chehalis, where the herd was then located. All that were sold were

tested for tuberculosis, and not a single case was found, while cattle which were kept appeared to be so eminently sound that they were not tested. They were returned to Kodiak in July, 1914, the disease not making its appearance until two years later, when arrangements were made to have the whole herd tested by a Government veterinarian. Dr. J. Madsen, inspector in charge of the branch office of the Bureau of Animal Industry located at Seattle, made the test in November, 1916. According to his report the test showed 25 sound animals, 21 reacting or infected animals, and 8 suspicious animals, which were isolated. All calves previously fed on unsterilized milk from the herd were treated as suspects and isolated, and these will be tested when of a sufficient age.

The most serious consideration involved in the test was what to do with the animals that reacted. To all appearances they were sound, except for the rise in temperature after the injection with tuberculin, and they were valuable animals. To slaughter every reacting animal would not only entail a great financial loss to the station, but would destroy the material for a valuable experiment. While the cattle can probably never be cured—that is, the germs will remain in their systems in an encysted form—it still may be possible to raise healthy calves from these affected animals. The fact has been established that tuberculosis is not inherited, but is a disease acquired by infection. On the recommendation of Dr. Madsen, it was decided to retain those reacting animals which gave no clinical symptoms of the disease and handle them according to the so-called Bang method. Dr. Bang is a Danish veterinarian of international reputation. Some years ago he found that the Danish dairy herds were largely infected with tuberculosis. To exterminate all animals which showed a rise in temperature after an injection with tuberculin, but which showed no clinical symptom of the disease, would have entailed an enormous loss to the country. He therefore devised a plan which proves successful when carried out strictly in accordance with instructions. Briefly, it consists in (1) killing all animals which show clinical symptoms, (2) isolating all animals which have reacted to the test but which otherwise appear sound, (3) breeding these affected animals in the ordinary way, (4) removing the calves dropped by affected cows when they are 2 days old and feeding them on sterilized milk, and (5) testing calves when 6 months old, putting nonreacting calves with the sound herd, and disposing of the reacting ones. As by this method it seems possible to raise healthy calves from valuable but affected cows, the plan will be followed at the Kodiak Experiment Station so long as it appears successful. No affected animals will under any circumstances be sold to the public. Animals will be slaughtered only in

the presence of an inspector who shall pronounce the meat sound before it is offered for sale.

Reduction of the herd.—The herd is increasing faster than the country can absorb the surplus. There have been very few sales to settlers, and these only bulls, though there is a demand for cows of good milking strains, which it is hoped can be met from the Holsteins and their crosses. At the present time it is a considerable strain on the resources of the station to provide winter feed for 60 or 70 head of live stock.

In order to avoid inbreeding, it will be necessary to purchase another pure-bred Galloway bull, which will become the head of the herd. Tentative arrangements for such purchase have been made, but not consummated for lack of funds.

BUILDINGS.

Two ready-cut cottages purchased for the Kodiak Station in the latter part of the year arrived too late to be put up in 1916, and they have not yet been erected. As the annual appropriation for the Alaska stations was not available until near the middle of August, it was impossible to purchase, ship, and erect these cottages before the winter set in. One cottage is intended for the superintendent or his assistant at Kodiak, and the other for the assistant in charge of the herd at Kalsin Bay.

For purposes of improved sanitation the dairy barn at Kodiak is now being reconstructed, but even after the work is finished it will be far from all that is desired.

FAIRBANKS STATION.

The activities of the Fairbanks Station have continued along the line laid out for its work several years ago. The year 1916 was less favorable than 1915. A drought in June stunted the grain, nevertheless everything that was seeded matured. Only about 50 acres was cropped because of shortage of hired teams in seeding time and because the wet weather in May so retarded the drying out of the ground that it could not be seeded in time. The detailed work of the station is reported on page 37. One important feature was the inauguration of cooperative experiments with the farmers in the neighborhood of Fairbanks, through which these farmers were incidentally given a start in raising varieties of grain grown at the station which are better adapted to the climate than grains offered for sale by seedsmen in the States. A brief report on these cooperative experiments is attached hereto. About 350 pounds of grain was furnished to each farmer who agreed to sow and cultivate it according to instructions given by the station, but for various reasons less than half of those

who received seed grain complied with the conditions. Efforts in this direction have, however, had the effect of arousing some of the better farmers to a realization of the need for grains suited to the country, and it is planned to extend this service and to cooperate very closely with the farmers' efforts to make their work successful.

In the detailed report the superintendent argues against the keeping of hogs on the Fairbanks farm, and proves that if the feed consumed by the station hogs had been sold on the market a larger profit would have resulted than could be gained from the production of pork. The fact that these hogs might not be worth in pork the cost of their feed does not vitiate the value of the experiment. The province of the station is to prove whether or not hogs can be raised in the interior, to find the hardiest kind of hogs, to overcome the obstacles that may be in the way of successful hog raising, and to demonstrate the best methods of caring for hogs. If it can be demonstrated that healthy hogs can be bred and raised in interior Alaska the main point has been settled. The fact that the economic conditions make hog raising on a large scale an unprofitable venture in the interior at this time is not a valid argument against continuing this experiment. Transportation facilities will improve, so that feed can be shipped at less than \$90 a ton, and other markets can be reached.

The above statements hold true not only for hog raising, but for every crop and product of the farm. The local markets are so easily supplied that there is soon an overproduction of commodities. When the Government railway to Fairbanks is completed many drawbacks to farming will be eliminated. Three or four years ago more than a thousand tons of potatoes was shipped into the Fairbanks district each year, because it was claimed that the interior-grown potatoes were worthless. Now, the local farmers supply the market and no outside potatoes are shipped into the country except when there is a shortage of the home product, as was the case this year. Chicken raising is profitable so long as there is no overproduction. Most of the feed for poultry can be produced on the farm, but if every farmer in the country were to go into the poultry business it would soon become unprofitable.

Several varieties of spring wheat matured at the station and produced creditable yields. There is now no market for this wheat except as stocks, because there are no flour mills, but the fact that wheat can be produced demonstrates the possibilities of the country, and that the time is near at hand when interior Alaska will become independent of outside flour mills. Other grain crops are equally as successful in the Fairbanks district as in the States.

The common tendency to devote the farm almost wholly to the so-called "money crops," and depend upon these to furnish cash for the purchase of many necessities that could be produced on the farm

without any direct outlay of money is all too prevalent. As his isolated situation naturally makes freight rates abnormally high, the pioneer farmer should especially endeavor to produce all that he requires in the line of vegetables, grains, pork, chickens, milk, beef, etc. His own need should first be met, after which his effort should be directed toward furnishing those products which the local market demands.

Alfalfa growing has not met with the success at Fairbanks that it has at Rampart, but this is probably because there has not been enough seed of the proper variety. The Rampart Station will be able to furnish some seed in the near future for the extension of the alfalfa experiments at Fairbanks. There is a patch of yellow-flowered alfalfa at Fairbanks, the so-called Semipalatinsk, but it does not mature much seed. It is hardy so far as resisting cold is concerned, but it blooms late and can not, therefore, maintain itself. Common alfalfa and Grimm alfalfa both severely winterkilled. Red clover, though it does not live through the winter, makes a splendid growth in the course of the summer, and can be grown not only for hay but for green manure, an item of increasing importance.

It has been pointed out in these reports that the soils become exhausted of their fertility and that this must be renewed. Under present conditions there is no more economical way of renewing it than by plowing under a crop of green manure. To this end the station was supplied during the summer with red clover seed to be sown in the spring of 1917 and the crop used to demonstrate this method of fertilizing the soil.

Because of lack of funds, no additional land was cleared the past year.

RAMPART STATION.

The detailed operations of the Rampart Station during the past year are given in the report of Mr. Gasser (p. 23.) Attention is called here only to those features which should be emphasized. As the season was backward and cold, the results were not so satisfactory as in 1915, when the weather was unusually favorable. However, all the grains matured except a very few that are too late for that section of country.

There are two main lines of work at Rampart; first, the development of varieties of grain which will mature without fail every year in interior Alaska, and second, the development of hardy varieties of alfalfa suited for hay and maturing seed in interior Alaska, so that they can be perpetuated and propagated indefinitely from seed raised in the country. All other work, as testing new varieties

of grain and other plants, comparing varieties of potatoes, growing pea and turnip seed, experimenting with flowers and garden vegetables, is important and valuable, but they are really side issues in comparison with the development of early-maturing varieties of grain and thoroughly hardy and productive varieties of alfalfa.

WORK WITH GRAIN.

The most effective means of developing early-maturing grain is to cross-fertilize selected varieties. The resulting crosses show remarkable variation in character, giving a large number of interesting types from which selections can be made and which may in time become fixed and permanent. (See Pl. III, fig. 1.)

Earliness is the one indispensable feature of varieties of grain for the interior. Within the limits of the period between frosts, rarely much more than 100 days, all grains must be seeded, develop, and mature seed. The plan of the station, then, has been to secure early-maturing varieties of barley, oats, and spring wheat from other sections of the world where these grains are grown, and use these in crossing with the later and larger varieties grown south of latitude 49°. The blossoms of the later varieties, which may not mature at Rampart, can be used in fertilizing blossoms of the early varieties that will mature. Nearly thirty varieties of early-maturing grains have been secured from northern countries with short summers like these of Alaska, most of them through the courtesy of the director of a Russian experiment station at Irkutsk, Siberia, and it has been found that all grains received from that source mature to perfection in Alaska.

The first crosses were made with barley, the Pamir being first used as one of the parents, though other early varieties have since been employed with better success. One of these is a black, two-rowed, bearded variety from Abyssinia (G. I. 362), which, when crossed on white, six-rowed, beardless varieties, resulted in a multitude of forms representing all possible variations from the black, bearded, male parent to the white, six-rowed, beardless, female parent. Some of these forms are superior to both parents, chiefly in vigor and size of head, but they are very unstable. It can scarcely be said that any of them have been so thoroughly fixed as to breed true, even in the fourth generation. However, it is expected that results from the season of 1917 will prove that some of these desirable crosses are becoming fixed types.

The same experiments were carried out with oats. A tall black variety, originally obtained from Finland through the Department of Agriculture, and named Finnish Black, has never failed to mature. It is desirable in many respects, being an early variety with tall

straw, making a good hay crop, standing up well in storms, and producing fairly good yield, but the grain is black and the kernels small and light, two characteristics which compare unfavorably with the later and heavier white oats. Crosses have been made with the latter and with other desirable sorts, but the work has not gone far enough to permit the announcement of the establishment of fixed types better than the parents. One of the cross-bred types, though it is all that could be desired in size and yield, has the fatal defect of producing weak straw that lodges too readily and is easily destroyed.

Of the several varieties of spring wheat obtained from the experiment station in Siberia, one named Chogot appears to be the best. It has matured at Rampart in 88 days, and without any improvement this variety can be depended upon to mature every year throughout interior Alaska. It has short straw, short bearded heads with brown chaff, and small grain, but it is apparently a very high quality of hard wheat which can take its place in the market along with other hard wheats grown below latitude 49°, making it possible for Alaska to produce all the wheat needed for home consumption. But the object of the station is the development of a wheat which shall not only be early but which shall have something of the vigor and yielding qualities of Velvet Chaff or Red Fife, as these varieties appear under the most favorable conditions. Many crosses have been made between Chogot and other Siberian varieties on the one hand and our larger, later-grown sorts on the other, but the ideal wheat has not yet been produced. The Siberian varieties seem to be dominant, nearly all crosses resembling them in size and yielding qualities.

The long-looked-for hardy winter wheat has not yet been found. The Russian variety known as Kharkov is the hardiest so far discovered, but it seldom comes through the winter with more than 50 per cent stand, often much less. The station is still looking for a hardy winter wheat and attempting to develop it by hybridization.

Winter rye, on the other hand, is a success. It requires about 2 feet of snow for protection, but with that, practically all varieties tested will come through the winter with a good stand and will mature fine crops of grain. It is not likely, however, that winter wheat or winter rye will ever become general crops in Alaska for the reason that it takes 13 months to produce a crop. These grains must be sown the latter part of July or the first part of August in order to give the plants a chance to become well established before cold weather, and the crops do not mature until the middle of August of the next year. It is, therefore, never possible to mature grain for seeding the same year it is harvested.

No early maturing spring rye has so far been found. This grain requires a longer season than wheat; in fact, that so far tested will not mature at Rampart in normal years.

The grain-breeding work at Rampart takes much time and space. The constant multiplication of crosses which must be tested for three or four years to make it possible to determine their value necessitates the use of a great number of plats, while thrashing, cleaning, and storing, and the study that must be given to all these crosses takes a large amount of the superintendent's time. The grain-breeding plats at Rampart Station in 1916 may be seen in Plate III, figure 2.

ALFALFA CROSSES.

Next to the production of early maturing, vigorous grains, there is no more important work than the growing of early alfalfas. *Medicago falcata*, the yellow-flowered Siberian species which has been referred to in many former reports, is perfectly hardy, and as it matures seed at Rampart it can be perpetuated in interior Alaska, where in the course of time its culture can be increased as fast as seed can be produced. It is very probable, however, that this species can be improved. The so-called hardy Grimm, a purple-flowered variety of *M. sativa*, is not entirely hardy in interior Alaska. It will stand two or three winters under a good coat of snow, but the third or fourth winter it usually succumbs. The leading characteristics of the purple-flowered Grimm are upright, vigorous growth, stiff stems, and large, dense foliage. It produces seed freely, the seed pods being spirals making two turns and black when ripe. Its hay-making qualities are superior to those of the yellow-flowered species, and it can be cut with a mower better than the more procumbent yellow-flowered species. An effort is being made to secure crosses between the two species which shall have the hardiness of *M. falcata* and the hay-making qualities of the Grimm. Such crosses have been made both by hand pollination and by insect pollination, it appearing that when the two species are grown in close proximity they cross-fertilize readily. Numerous selections have been made from the crosses thus obtained, some of which may prove valuable if they can be established. Among them all a single plant, found as a chance cross in a plat of Grimm, may meet the requirements. It is upright in growth and fairly leafy, resembling the Grimm except that it is entirely hardy and has the yellow flowers characteristic of *M. falcata*. The one turn in the pod will prevent seed shattering, an improvement over the pods of *M. falcata*, which are only slightly curved and which split open and shatter the seed readily whenever they are fully ripe. Several years' work with this cross will demonstrate whether expectations are realized in this plant. In the meantime scores of other crosses will be observed from among all of which, it is believed, at least one variety can be established that shall meet the demands of the climate and the needs of the farmers throughout the country.

VETCH.

Among the other legumes under experiment, *Vicia cracca*, an uncultivated native vetch indigenous to New England and southward to Kentucky, is by far the most promising, as it has proved entirely hardy in interior Alaska. A perennial spreading by creeping root stocks, it very soon forms a dense thicket standing 2 to 3 feet high. Though *V. cracca* produces seed sparingly, enough has been hand gathered to plant an acre or more. It is a matter of regret that there is no seed on the market, as this is undoubtedly a most valuable forage plant for northern latitudes.

CONDITION OF THE STATION.

When the station was visited by the writer—August 15 to 22—nearly all the early varieties of barley had been harvested, and the harvesting of all other grains was in full swing. Most of the grains were ripe except such late varieties of spring wheat as Red Fife, Velvet Chaff, and the so-called Alaska, a large-growing late variety with branching heads which never matures in the short summers of the interior. The turnip seed was harvested. The alfalfa seed was beginning to ripen, what was then ripe being gathered by hand, as seed of the hardy alfalfas is very precious and none must be lost. Its somewhat uneven ripening on different plants necessitated leaving late pods until they reached full maturity. The vetches were in bloom, but little seed had matured at that time.

Notes were taken on the many hybrids then in test plats. Though some were promising, others not, none had been cultivated long enough to be so fully established as to come true to type. It is therefore too early to say much about them. It must be noted, however, that the few barley hybrids, which have been grown for more than four generations and which at one time gave promise of great things, seem to have deteriorated, particularly as to size of head, though other characteristics have been retained. The climatic conditions in these high latitudes are adverse to the growing of large, vigorous grains. Earliness, fine straw, and small heads go together. The wheat crosses were in a measure disappointing, as few showed any improvement in size and vigor over the Siberian parent, while the larger and later parent was not equaled by any of them. Marquis spring wheat, a desirable variety and a favorite crop with Canadian farmers, was ripe about August 24, but it was disappointing in that the straw was short and the heads very small. It is a trifle too late in unfavorable years and has not been as productive as Romanow, a variety which has been grown at the interior stations since 1908. The writer obtained from a seed house in Sweden a small sample of a white oat named Crown, with large, white, plump grains, which

matured perfectly by August 16. If it can maintain vigor, size of kernel, and yielding qualities in interior Alaska it will be a valuable acquisition. A two-rowed and bearded variety of barley named Gold obtained from the same house matured perfectly by the middle of August, but in view of the fact that a number of varieties of excellent barley are already grown at the station this will not be a particularly valuable acquisition.

The garden pea called Alaska was planted for the purpose of obtaining the seed to introduce this variety as a field crop. Beginning to ripen August 16, most of the peas had matured before frost. This point is of some interest inasmuch as the Canadian field peas which have been grown at both Fairbanks and Rampart matured practically no seed. Though not a vigorous legume, Alaska is a variety which, when sufficient seed is produced, can be grown both for feed and for green manure.

It is planned to clear more land as funds become available. Nearly all the flat land fronting on the river has been cleared and proves to be richer than the knolls and rolling uplands.

NEEDS OF THE STATIONS.

When the Kodiak Station was visited by the chief inspector of the Bureau of Animal Industry at Seattle in November, 1916, he condemned the barns as unsanitary. The barns were erected several years ago from sales funds as these became available and were considered as only temporary structures. To replace them with proper buildings having cement floors, high ceilings, and abundant lighting, sanitary feeding, and watering equipment, etc., will require expenditures of at least \$5,000. The conditions criticized are being improved, but without a larger appropriation the changes will have to be made slowly, and this delay will retard the experiment in reestablishing the herd through the isolation and hand feeding of calves from reacting dams. A modern dairy building is also needed at the Kodiak Station in order that experimental work may be carried on under proper conditions.

At both the Fairbanks and Rampart Stations the amount of field-work has become too great for the teams on hand and hired teams are very expensive and hard to get. With the development of the farm tractor that has taken place within the past few years, it is believed that such an implement could be more economically used than teams for much of the heavy work. A tractor has been purchased for the Fairbanks Station at a price about equal to that demanded for a good team, and should it prove useful a similar machine should be secured for the Rampart Station. A cottage is needed for

the assistant at Rampart, the old log house having become almost uninhabitable. A small building similar to the one purchased for the Kodiak Station is recommended for this station. The necessity still exists for a small greenhouse to be used in connection with the plant-breeding work at the Rampart Station. By having such a building the period within which cross-pollination could be carried on would be considerably extended.

REPORT OF WORK AT RAMPART STATION.

By G. W. GASSER, *Assistant in Charge.*

WEATHER CONDITIONS.

With the 10-year average given in last year's report as a basis for comparison, the winter of 1915-16 was normal, both as regards temperature and precipitation. The first snow to remain came October 7, when 5 inches, the heaviest during any 24-hour period of the winter, fell. Ice began running in the Yukon October 12 and continued until October 13, when the channel blocked immediately above and below the Government tract. The open body of water just in front of the station did not freeze over until November 25. By the end of December there was 15.65 inches of snow on the ground, only a little less than half of the winter's fall of 34.40 inches. As usual, the coldest weather came in January, when for eight days the minimum temperature ranged between -50° and -61° F. During March only a trace of snow fell. High windstorms were of frequent occurrence, and many bright parhelia and brilliant auroras were observed. There were only three cloudy days throughout the month and likewise only three days when the minimum did not go below zero, the lowest being -43° on March 11. April was just the reverse, rather cloudier and warmer than normal. By April 25 the rolling fields were clear of snow, but this lingered two weeks longer on the lowland fields. The ice broke in the Yukon May 11, and 12 days later came the first steamboats of the season.

The summer rainfall of 5.59 inches was unusually well distributed, approaching very closely the seasonal 10-year average of 5.66 inches. The first killing frost came August 26, giving a frost-free period of 89 days, 8 days less than the 10-year average. May had one clear day, June three, July eleven, August five, and September one. During the above months rain fell in measurable quantity on 43 days. Rain fell on each of the first 10 days in October, totaling 2.39 inches, while the heaviest daily precipitation of the season, 0.73 inch, fell on October 3.

GENERAL WORK.

The regular routine of plowing and harrowing, seeding and harvesting, occupied the major portion of the time. As usual, the ground to be cropped was plowed in the fall, a practice found to permit earlier seeding than spring plowing, while ground so plowed is left rough and open long enough to absorb a greater amount of water in the spring when the snow melts, which amount is small enough at best. Fall plowing also insures a firm seed bed and a re-establishment of capillarity between the furrow slice and the subsoil, a very necessary condition here, because of the scant rainfall. The ground dries off more or less unevenly and should be harrowed as fast as it dries so as to prevent its becoming hard. Though fall plowing is more particularly beneficial to rolling land, lowland should also be fall plowed, primarily because time is saved thereby in the spring, when time is at a premium. After the moss has been removed from this lowland, largely by burning, there remains a layer of partly decayed moss, from 1 to 6 inches in depth. After having been plowed and harrowed a couple of times, this peaty material becomes dry and loose, a very poor medium in which to grow crops. It has been found advantageous to give the ground a second burning after having worked the surface into a powdery condition, a marked improvement having been observed in the resulting crop. By running the plow a little deeper each year for a few seasons, the heavier subsoil will be intermingled with the porous and somewhat peaty surface soil, making for physical improvement, at least.

In order to ascertain whether or not the ground froze as deep as it had thawed the previous summer, a hole was sunk April 13, just back of the cottage in the field that has been in continuous cultivation for 11 years. At a depth of 7 feet, a layer of earth $4\frac{1}{2}$ inches thick was encountered, having the appearance of and working like thawed dirt. But inasmuch as miners have found such strata at depths precluding the possibility of their having been thawed from above, it can not be concluded that the $4\frac{1}{2}$ -inch streak represented the juncture of the seasonal frost from above and the permanent frost from below. Sinking for 3 feet more showed only a continuation of frozen subsoil. On September 22, within a short distance of the hole dug April 13, a hole was dug to frost, which was encountered at a depth of $8\frac{3}{4}$ feet. On the same date on land which had been in blue-grass sod for 7 years and with a southern exposure, frost was found at $7\frac{3}{4}$ feet, while in a lowland field which had been under cultivation for 3 years, there was only $4\frac{1}{2}$ feet of thawed surface, and just across the road in uncleared land, under 5 inches of moss, it was only 9 inches in one place and 12 inches in another to permanent frost. From these tests it is evident that the winter freeze penetrates as deep as the seasonal thaw even in the most favorable situations.



FIG. 1.—HYBRID BARLEYS, RAMPART STATION. PISTILLATE PARENT ON LEFT, STAMINATE ON RIGHT.



FIG. 2.—GRAIN BREEDING PLATS AT RAMPART STATION.

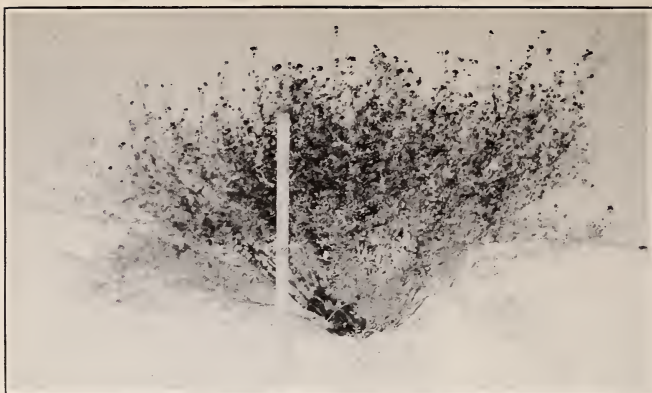


FIG. 1.—*MEDICAGO FALCATA* USED IN CROSSING EXPERIMENTS.



FIG. 2.—GRIMM ALFALFA USED IN CROSSING EXPERIMENTS.



FIG. 3.—A YELLOW-FLOWERED ALFALFA WITH COILED PODS, PROBABLY A SPONTANEOUS HYBRID.

This fact has, however, no agricultural significance. As spring seeding begins by the time the frost has receded from 1 to 3 feet the presence of a layer of thawed earth down some 5 to 7 feet below the surface can not advance the time of spring seeding. In one respect, at least, proximity to the surface of permanent frost is an advantage since it prevents a rapid settling of the soil water left near the surface by the fall rains.

The remaining block of uncleared lowland, some 20 acres, mentioned in last year's report, was cleared to the extent of grubbing and piling in windrows the scrubby growth of spruce and willow. As time permits next summer the narrow strip between the windrows will be torn up with a coulter to facilitate drying and to present raw edges to give the fire a point of attack when the windrows are burned. Five of the 20 acres in the drier upper end, where the fire did good execution the previous season, was cleared up, and although rough, was mowed, yielding three loads of native hay. After removal of the hay the land was plowed and will be cropped next year.

Adjacent to the above-mentioned 5-acre tract lies a body of land of considerable extent, well suited for agricultural purposes. Repeated burning having destroyed the greater part of the moss and timber, native blue top is getting a strong hold. This ground is comparatively easy to clear. The stumps have been dug out, and together with other wood and trash, piled ready to be burned on some 15 acres of this land, which will make a fine field, much drier than the lowland that has just been cleared and is in part under cultivation.

A ditch was dug along the upper edge of one of the fields to take the spring run-off and prevent gullyng, and another draining about 20 acres of the lowland was thoroughly opened up. Next year some temporary ditching done this fall will be extended and laid out permanently to further facilitate the draining of the lowland. A new field road was laid out, reaching the tract on which clearing was begun this fall. During the slack season last winter a small bedroom was added to the cottage.

Nineteen acres was cropped to oats for hay, 13 acres of which was lowland. Five acres of this lowland had never been cropped before, and 2 acres of this new ground was quite peaty and produced a light crop. The rest of the lowland yielded a satisfactory though not a heavy crop, nearly all of which was cut with the binder, a fortunate circumstance as the fall turned out to be most unfavorable for curing hay. From the time the oats were cut on August 26 until they were hauled in on October 18, a period of 44 days, 4 inches of rain fell on 18 nonconsecutive days, and there was, moreover, considerable fog, only 5 days being clear. At no time was the hay dry enough to stack

until freezing weather came, but it was perfectly cured and, except for a few wet butts and caps, is bright, clean, and of excellent quality. The rest of the hay was on higher ground and fared better as it came on earlier in the season and could be put under shelter before wet weather set in, but the crop was lighter than on the lowland.

Despite the fact that the brome grass field was given a light dressing of stable manure last fall and early this spring, the crop was very light. Evidently it should have much more moisture than is available here. Though perfectly hardy, it can not be recommended for a hay grass.

ALFALFA.

After the trial of a number of varieties and strains, the work with alfalfa now includes only the increase by seed production of the few valuable sorts, the selection of promising individuals, and the production of new strains by hybridization.

The Siberian alfalfa (*Medicago falcata*) continues to hold its place at the top of the list as the one of many capable of fulfilling all requirements. (Pl. IV, fig. 1.) However, there is still room for improvement, as to be an ideal hay plant it should have an erect stalk rather than a partly procumbent one, as it now has, and its seed-shattering propensities should be remedied. With these two points in view, plants spaced 2 by 3 feet are being grown as individuals. About one-fourth acre has been set out, using plants from plat seedings. A study of the plants in this quarter acre shows a wide variation among the individuals. A number of selections were made last year and again this year, and the seeds planted separately, but it is realized that the number of individuals from which to select should be increased in order to improve the chance of finding the one really desirable plant. From this year's seeding enough plants will be taken next spring to make an acre, the plants to be grown individually and spaced 3 feet apart in the rows instead of 2 feet as heretofore, in order to give them more room, as even at that distance the branches will interlace somewhat. Enough seed was secured from last year's crop to plant about 3 acres this spring by drilling it thinly in rows 3 feet apart. Growing it thus facilitates clean culture, the study of individuals, and the harvesting of the seed. Enough seed ripened this year to plant between 5 and 10 acres. As the wet fall prevented the alfalfa pods from drying thoroughly, the seed is still under shed, for unless it is perfectly dry it is difficult to separate from the pods and chaff. As seed of this alfalfa ripens late in the season, it has been found best to do the thrashing in April when there is an abundance of bright drying weather.

The half acre of Grimm alfalfa seeded two years ago last spring (station seed) made a splendid growth this year, practically every

plant coming through the winter and starting off vigorously in the spring. Blooms began to show June 20 and seed began ripening the first week in August. It is in this plat that the many interesting variegated plants are growing. Selections have been made of the most promising and divergent types, a record kept of the behavior of each, and the seed planted separately. Unfortunately the partly procumbent type predominates among the variegated plants, as in the *Medicago falcata*. One of the plants coming very near to fulfilling all requirements has a nearly upright, rather coarse stalk with scant foliage, purple buds, light yellow flowers, and seed pods with one turn, which are brown when ripe. Its valuable features are erectness of growth and spiral pods, both Grimm characteristics. It remains to be seen whether or not this plant has the perfect hardiness of *M. falcata*. Since it has been growing for two years on the highest ground in the plat where the snow covering is rather scant there is every indication of its being hardy, a point which additional tests for a winter or two more ought to settle. Meanwhile the seed ripened will be planted separately on the chance that it will prove to be what is wanted.

The plats of Disco and Hardy Grimm ripened some seed this year. Judging from the Disco plat seeded in the spring of 1914, this variety seems on a par with Grimm for hardiness, and it resembles Grimm very closely in having purple flowers and erect stalk. Both this year and last year the leaves have been yellow and the vigor low. The so-called Hardy Grimm, grown last year from seed from South Dakota, has not proved to be hardier than regular Grimm. Although well protected with snow, about 45 per cent froze during the last two winters, the growth was weak, and very little seed was produced.

A few scattering plants of Semipalatinsk alfalfa made a fair growth this year and ripened a little seed, but as apparently all were dead in the spring the plat was seeded with other alfalfa. Next spring the Semipalatinsk plants will be transferred to a separate plat. Semipalatinsk is yellow flowered with a partly procumbent stalk having seed pods three-fourths turned, brown when ripe, and inclined to shatter the seed. Among the plants a quite erect one was found bearing some ripe seed, which was kept separate.

Obb and Gobi Desert alfalfas have been described in previous reports. Though perfectly hardy, they are not considered valuable because of their procumbent growth and sterile blossoms. Obb, however, ripened a little seed this year for the first time in the five seasons that it has been growing here.

Small plats of Cherno, Mongolian, and sand lucern, seeded in 1914, were plowed up this spring, as practically all the plants were dead. Earlier seedings winterkilled.

HYBRIDIZATION WORK.

Alfalfa.—Reciprocal crosses were made between *Medicago falcata* and Grimm alfalfa. (Pl. IV, figs. 1 and 2.) Scarcely 2 per cent of the blossoms treated produced seed. Since cross-pollination by hand is at best rather uncertain, the writer advocates the simple expedient of leaving this important work to the bees. The two varieties to be cross-fertilized should be planted in adjacent plats, or, better still, in alternate rows in the same plat, but should be located as far as possible from other alfalfa in order to minimize the likelihood of fresh pollen from other than the desired varieties being tracked across the stigma by the insects. That true hybrids are produced by the bees is evident from the many variegated plants growing here in a plat of Grimm alfalfa from station seed. (Pl. IV, fig. 3.) Though insect pollination can not be depended upon from a perfectly scientific point of view, the practical phase of it is attractive and valuable.

Spring wheat.—A total of 85 heads of spring wheat were cross-fertilized, as follows:

	Heads.		Heads.
Tulun × Chogot.....	7	Marquis × Romanow.....	2
Chogot × Tulun.....	9	Marquis × Velvet Chaff.....	4
Ulka × Chogot.....	1	Velvet Chaff × Marquis.....	6
Chogot × Ulka.....	2	Velvet Chaff × Ulka.....	8
Chogot × Romanow.....	4	Ulka × Velvet Chaff.....	7
Velvet Chaff × Chogot.....	4	Romanow × Velvet Chaff.....	1
H. G. × Chogot.....	4	Velvet Chaff × Romanow.....	4
Marquis × Chogot.....	1	Velvet Chaff × Tulun.....	4
Marquis × Tulun.....	1	Romanow × Ulka.....	3
Marquis × Ulka.....	2	Ulka × Romanow.....	2
Ulka × Marquis.....	2	Tulun × Romanow.....	5
Romanow × Marquis.....	2		

All of these wheats have been raised and ripened here for at least three years and a few for a considerably longer period. Chogot is a typical representative of a type of very early Russian wheat, with short straw, small bearded heads, angular, amber, and hard kernels, and seed which shatters very freely when fully ripe. Its chief merit is earliness, it having ripened here in 78 days. It is a well-established, constant sort. Two years ago crosses were made using Chogot as the staminate parent, with Irkutsk, Marquis, Romanow, and H. G. pistillate parents. Both the F_2 and F_1 generations have been disappointing. By far the majority of them were so like their staminate parent that they were at best no better. A very few showed diverse characters which merited further trial, but of the several thousand progeny none were widely divergent. From the more extensive crossbreeding done this year, better results are expected.

Winter wheat.—Thirty-four heads of winter wheat were cross-fertilized as follows:

	Heads.		Heads.
Sandomirka × Kharkov-----	14	Sandomirka × Andrischinskay---	3
Andrischinskay × Sandomirka---	9	Andrischinskay × Kharkov-----	8

No previous hybridization of winter wheat had been attempted. The problem is to secure a hardier, earlier variety, having stiff straw and, if possible, no beards.

Barley.—Seven heads of barley, S. P. I. No. 12709, were crossed with S. P. I. No. 19557. Both of these barleys are 6-rowed, the former medium early, hull-less, and hooded or smooth, the latter early and bearded. The object in barley breeding is not so much earliness as stiffness of straw and beardlessness. From the mass of aberrant forms produced during the last five years very few have been selected which bid fair to measure up to the required standard, but these few are proving worthy of a place among the standard sorts. They are vigorous, strong of straw, early, hooded (that is, without beards, except for one very fine bearded type), and hull-less, having larger heads than their parents.

Oats.—The following oat crosses were made: Hansen × Norwegian, G. I. No. 500, 3 heads; Hull-less × Norwegian, 4 heads.

The oat called the Hansen, South Dakota No. 278, is a large growing, paniced, white variety having very pronounced beards much like those of false wild oats. No. 500 is also paniced, but black, short strawed, and considerably earlier. The Hull-less oat, which was obtained from Washington State College, is a medium-early variety, white and paniced, with naked kernels when thrashed. Since most of the oat types tried here have been too late in maturing for this latitude, the end in view is to produce an early-maturing, stiff-strawed, nonshattering, and productive strain.

Rye.—Six heads of Irkutsk spring rye were crossed with Gesselberg. As rye is latest to ripen of all the spring-sown grains, the primary object in crossbreeding is earliness. However, another fault to be corrected, if possible, is partial sterility, as many heads are 50 per cent sterile, while a head perfectly filled is rare.

No crossbreeding of winter rye was done this year, but as with spring rye the problem of sterility comes up. Though in point of earliness the present varieties of winter rye do very well, a growing season shortened a week or two would be better, and is worth working for along with other improvements.

SPRING RYE.

Of all grains grown at the Rampart Station, spring rye is least adapted to conditions, and has responded least to hybridization. Irkutsk is the best variety tried so far. It is vigorous, growing to a

height of 5 feet, and has large heads containing from 40 to 50 grains, though very few are well filled. While it is the earliest of the spring ryes, it has always failed to entirely ripen. Gesselberg, a smaller variety having a greater percentage of sterile glumes, is at least 10 days later than Irkutsk, and not over 10 per cent has ripened. Mammoth is not what its name implies, for it has neither long straw, large heads, nor kernels of unusual size. Sterility and lateness are its chief faults. Hybrids from the above parentage show little, if any, improvement.

WINTER RYE.

Unlike the spring grain, winter rye is a pronounced success. Seedings made in low land July 26, 1915, did remarkably well, coming through the winter practically uninjured, though the straw grew so tall and heavy that much of it lodged, a very unusual thing for rye, due in part in this case to a windstorm. The total area given over to winter rye was $1\frac{3}{4}$ acres, divided into four large plats and one small one. As much as possible of the crop was harvested with the self-binder, but about 20 per cent, which had lodged badly, had to be cut with a scythe.

A new Russian variety, Hogot, showed great vigor, one plant attaining a height of 77.5 inches, with heads 5 inches long containing 70 kernels, and the average height of one drill-row plat being over 5 feet. This plat was ripe by August 15, when it was harvested. The heads were better filled than were those of other varieties. Rye No. 12890, three-eighths acre, which was ripe by August 14, averaged 50 inches in height, with an occasional 70-inch culm, and had 30 to 46 kernels per head, some of which showed from 5 to 20 sterile spikelets. The above description applies also to No. 1134, three-eighths acre. No. 281, one-fourth acre, and No. 959, three-fourths acre, were less vigorous than the last two described, and are considered inferior to them. The winter rye as well as the spring grain could not be thrashed this fall because of the wet weather.

SPRING WHEAT.

Thirteen varieties of spring wheat were grown. These were Chogot, Irkutsk, H. G., Tulun, Romanow, Marquis, Velvet Chaff, Ladoga, Alaska Red and Alaska White, Red Fife, Early Java, and Haines Pedigree. A plat of 0.41 acre was seeded with Chogot. The straw was very light and the heads short, yet the yield, on an acre basis, was 17 bushels. Last year a smaller plat yielded at the rate of 13.3 bushels per acre. This year the wheat ripened in 90 days; last year in 88 days. The grain is hard, and is said by a miller of long experience to have good milling qualities. It is, therefore, not at all improbable that interior Alaska will grow its own wheat for bread, as

well as enough cereals of all kinds for home consumption, once there is sufficient land under cultivation.

All the wheat varieties ripened some seed with the exception of Alaska—a variety of no practical value. Haines Pedigree is identical with Velvet Chaff, but 50 per cent of the latter ripened, and only 25 per cent of the former. The heads are large and smooth, containing from 30 to 50 plump kernels with a tendency to sterile tips. Where Chogot grew to a height of only 20 inches, Velvet Chaff and other varieties attained a height of 36 inches. The finest plat in appearance was of Ladoga, which produced an even stand 3 feet high, bearing fine heads with an average of 45 kernels, both straw and heads being rich amber when ripe.

Thirty-four single-head rows of wheat were grown. One of the problems undertaken by the station is to discover, if possible, a strain of Chogot wheat that does not shatter when ripe. Last year a number of heads were selected, some having clasp glumes, others open. While the preliminary study this summer indicates that there is a slight difference morphologically, it is believed that closeness and ripeness are correlated.

The station has also taken up a study with both wheat and barley of early and late ripening heads from the same plant. Almost invariably the earliest heads are the smallest. Often a head ripening 10 days later than another on the same plant is one-third larger. In order to find out whether or not this difference is maintained early and late heads were selected and planted in adjoining rows. Continued selections of the progeny will have to be made for a period of years before definite conclusions can be reached.

WINTER WHEAT.

Plats of winter wheat were seeded July 26, 1915; one-fourth acre with Kharkov; one drill row each, 250 feet long, with Sandomirka and Andrischinskay; and one drill row 20 feet long with Klondike. Klondike froze completely. The other three were hardy to about the same extent with 75 per cent resistant. Kharkov, which ripened unevenly and lodged almost completely, was harvested August 26, the largest head being 4.25 inches long and well filled. Sandomirka made a good appearance with its few terminal beards and light colored grain and chaff, the largest head being 6 inches long and containing 76 kernels, but about 25 per cent of this variety lodged. Andrischinskay, planted here for the first time, grew to the same height as other varieties, about 38 inches, had straw of the same strength as that of Sandomirka and short terminal beards, the largest head being 5 inches, and yielded plump and well ripened grain when cut, August 24, the same date as that on which Sandomirka

was harvested. From selections made last season, single-head rows were planted this year on August 3. A number of hybrid seeds produced in 1915 were also planted.

BARLEY.

With the exception of one variety, all barley grown this year has been described in previous reports. The new variety came from a Swedish seed house. It is a two-rowed, bearded sort, called Gold. It grew to a height of 35 inches, tillered well, and, what is of considerable value, each tiller produced a head. The straw is strong, scarcely 5 per cent lodging, while the heads average 22 grains each. Seeded May 15 and ripening August 24, this variety required a period of 100 days, 12 days longer than the average barley and 22 days more than the earliest. Next year when station-grown seed is used, it may ripen earlier. At both Svalof and Ultuna, Sweden, this variety of barley gave the highest average yield of all varieties for the years 1900-1909.

Altogether there were 41 plats of barley, 11 being variety plats of standard sorts, such as Manshury, Primus, Boehmer, Hull-less S. P. I. No. 19851, and Hull-less S. P. I. 12709. They are grown at present to keep up a performance record and to serve as a check on the hybrids and new sorts. The majority of the plats were head-to-row plantings from which selections were made for next year's seeding.

OATS.

Oats was the principal crop grown, only a few acres of which was intended for seed, the greater area being cut for hay. Oats from all the larger fields were cut with the binder, and, when dry, stacked in the yard until they could be thrashed.

One 5-acre field seeded with Finnish Black oats on May 19 produced a good stand 36 inches tall, but of only fairly strong growth, which ripened August 17. The next largest field, a 2-acre tract of South Dakota No. 637, seeded May 25, produced a quite heavy growth, but lodged badly in places just before ripening on August 24.

One acre of drier ground than that for No. 637 was seeded with Norwegian G. I. No. 500. The straw was quite short, only 30 inches, a characteristic of this variety, but the heads were normal in size and well filled, the kernels running from 30 to 60 grains per head. Despite its short straw it was lodged somewhat by a heavy wind-storm from the northeast.

A quarter-acre plat of Banner oats, drilled May 18, gave a good stand with strong even growth, but it ripened very unevenly, small areas being well ripened by August 31, 10 days earlier than the rest. Though Banner oats has medium-sized heads, it is a good yielder, with plump, yellow-white grain, and is a valuable variety where the



FIG. 1.—GRAIN INCREASE PLATS, RAMPART STATION.



FIG. 2.—VICIA CRACCA SHOWING DENSE GROWTH, RAMPART STATION.

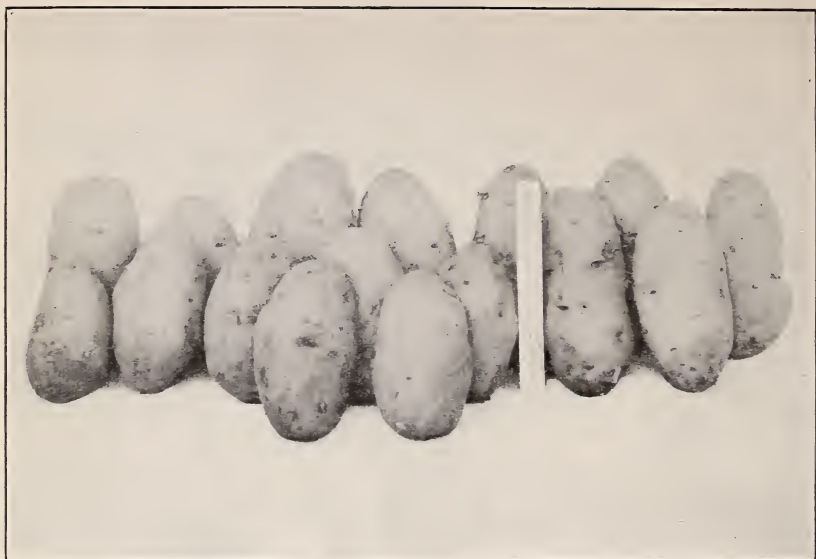


FIG. 1.—BURPEE SUPERIOR POTATOES, 13 POUNDS FROM ONE HILL.



FIG. 2.—TOMATOES GROWN OUT OF DOORS, RAMPART STATION.

season is long enough to ripen it evenly. In this plat of Banner oats was a sprinkling of "false wild oats," the first to appear at this station.

In smaller plats the system of head-to-row planting was followed as with the other grains. As a side experiment the small central kernel occurring in the spikelets of such varieties as Hansen, Norwegian, and Banner was planted separately. For example, seed from one head of Hansen oats having 110 large kernels and 44 small kernels was planted in adjacent rows. The result was rather surprising, inasmuch as the small kernel seed produced some plants as vigorous as the large kernel seed, but produced also some inferior plants, while the large kernel seed did not. The result was less favorable for the small kernel seed with the Norwegian and Banner.

A large number of hybrids were grown, comprising series of three groups. The 25 series in the F_4 generation has only one representative left, 25a-1-2-1-1, which did not lodge this season. This has panicked heads, gray kernels with a pronounced purple bloom, good vigor, and fairly long straw. Others of this group did well until this year, when they lodged badly, a fault the staminate parent Copperfield, a mutant of Finnish Black, developed after having been grown here for a few years.

The F_2 progeny of Black Tartarian \times Yakutsk broke up, as might have been expected, into several interesting types. Black Tartarian is a side oat, strong growing but rather late; Yakutsk an early, white, small-grained variety with short, panicked straw. As black is dominant, in the F_1 generation all were black. This year the F_2 generation split up into side black, side white, panicle black, and panicle white, all showing minor distinctions in color of grain and arrangement of spikelets. A large number of selections were made which will be tried out next year.

Two new oats from Sweden, one named Victory, the other Crown, were given trial this year. Both gave perfect germination tests and are alike to the extent of being white and panicked with strong straw. Crown stood the better and produced the larger heads, averaging 60 kernels per head. Both ripened in 100 days this year, as did Finnish Black, which places them in the same class in this important respect. Victory is a pure-line selection from Probstieier and is considered at the Svalof Experiment Station, where it was produced, the highest yielding white oat grown there. It will be given a thorough try out here.

Increase plats are maintained of all promising varieties of cereals to secure larger quantities of seed grain for extensive trial. (Pl. V, fig. 1.)

VETCH.

The plat of *Vicia cracca* seeded in 1914 made a stronger growth and ripened more seed than last year. It is unfortunate that the seed of so valuable a plant can not be purchased in the open market. The plat was extended this year, and with the seed on hand enough more land can be seeded to make an acre. (Pl. V, fig. 2.) When this acre plat gets into seed-bearing form the increase will be rapid. Vetch does not produce from a crown, as does alfalfa, the crown of which grows larger and throws up more branches the better established and more vigorous it becomes, the one crown persisting and no new plants being formed from it. Vetch, on the contrary, consists of a mass of fibrous roots, the plant spreading by means of rhizomes. In this way a plat of vetch, though seeded in drills, invades the intervening space and forms a continuous mat of plants.

A few ounces each of hairy winter vetch and gore tares was received from a seed house in Sweden. A part of the supply seeded in drills produced a stand all but perfect, and the plants grew vigorously, making a mass of foliage by fall. The tares had much larger leaves and larger seed pods than vetch. Both began blooming July 24 and pods set very freely, especially on the tares, but only a few ripened, more ripening on the vetch than on the tares. It is hoped that the vetch (*Vicia villosa*) will prove to be hardy. The tares (*Vicia sativa*), an annual, will be given further trial.

POTATOES.

Potato planting was begun May 11. The total area planted was 1 acre, part of the field being on a knoll that is always too dry to crop well. The rows were laid out with a turning plow and covered with a specially constructed drag, with a roller attached, which packed the earth firmly in the rows. The seed, sprouted as usual before planting, was set 3 to 4 inches deep.

In order to test the comparative value of one-eye seed and normal seed, alternate rows of Burpee's Superior were planted with seed cut to a single eye and with seed cut in the usual way; that is, with not less than two good eyes and an occasional whole potato of medium size. Three rows, each 210 feet long, were planted with each kind of seed. The plants from single eyes were two days longer coming up and did not make as thrifty a growth as from normal seed, but there was no difference in time of blooming. The results in terms of yield, however, were decidedly in favor of the normal seed pieces, the average for the three single-eye rows being 172.33 pounds, for the three normal rows 225 pounds, a gain of 30.5 per cent in favor of the latter.

One-half acre was planted with Burpee's Superior. The yield was 5,656 pounds, or at the rate of 5.6 tons per acre. (Pl. VI, fig. 1.)

The one-third acre of Irish Cobbler did not do as well, yielding 2,698 pounds, or at the rate of 4 tons per acre. The remaining one-sixth acre was given over to 32 varieties, 50 hills to a variety. Because of conditions noted below it was thought best to abandon the original idea of a comparative-yield test.

The yield of the Irish Cobbler was reduced considerably by an affection of the leaves and stalk, the first symptoms of which were noticed the last week in July. The edges of a few leaves began drying and turning black as though frosted, and gradually other leaves were affected, then the stalk beginning at the tip, some plants being completely blackened by the middle of August. Occasional brown lesions were found on the stalk below the surface of the ground, but generally the diseased area extended to the surface only, at which point the weakened stem gave way. The tubers, though small, were unaffected even in the most aggravated instances. Just what caused the trouble can not be definitely stated at present, though it appears to be a combination of sunscald, tipburn, and a touch of early blight (*Alternaria solani*). Some varieties seemed decidedly more resistant than others, but it is impossible to classify any as either resistant or nonresistant, as a variety that showed little disease in one row would in another row be badly affected. For instance, in the variety test State of Maine was only slightly diseased in one plat of 50 hills, while elsewhere both leaves and stalks were suffering severely. The same is true of Rural New Yorker, Green Mountain, Late Puritan, and others. The disease was most severe on Irish Cobbler and Uncle Gideon's Quick Lunch, every plant being stricken to the ground in the 50 hills of the latter, on the stalks of which a few lesions appeared just under the surface of the ground, but the tubers were clean. In one-third acre of Irish Cobbler on the top of a knoll virtually every plant was killed to the ground, while the Burpee's Superior potatoes alongside were practically untouched.

GARDEN.

The garden plat of 0.15 acre is well situated on a gentle slope to the southeast. Every fall it has been given a dressing of manure and both last year and again this fall an application of wood ashes. It is fall-plowed as deep as the plow will run—that is, from 10 to 12 inches. The soil is a typical bench, silt loam, brown, friable, neutral, and well adapted to intensive cultivation.

Such hardy vegetables as lettuce, beets, and carrots were seeded May 9.

Peas.—Nott's Excelsior and Alaska peas, planted May 14, were in bloom June 14 and ready for the table July 1. They bore abundantly. In addition to the peas in the garden, 0.16 acre was planted with the

Alaska variety for the purpose of seed production. The seed for this plat, after having been soaked and laid out in a gunny sack in the garden house to sprout, was dropped by hand May 16. The vines bloomed June 24, ripened the first pods July 31, and were pulled August 25. The yield of thrashed peas was 165 pounds, a rate per acre of 1,031.25 pounds.

Beans.—Early Refugee beans, planted May 25, were in bloom a month later and bore pods of edible size by July 15. They were very productive. Seeds of both peas and beans were put to sprout in boxes of sawdust 10 days before planting.

Cabbage.—Early Dwarf Flat Dutch and Early Jersey Wakefield, set out May 24 did well, producing a number of heads weighing 11 pounds each. Wakefield matured too early and many of the heads burst.

Cauliflower.—Every plant of Early Snowball and Extra Early Erfurt, the varieties used, produced heads of edible size, but none were large. The first heads were cut July 10. It is worthy of note that the Erfurt seed was 10 years old, yet it was as viable as the fresh Early Snowball and produced as vigorous plants.

Tomatoes.—Spark's Earliana, Puget Sound Special, and Puget Sound Forcing all produced equally well, but the last two proved to be of inferior flavor. The plants were transferred from flats to paper pots early in the season, so that by June 1, when set out in the garden they were quite large, all being in bloom and one having set fruit. By July 23 the first spurs required staking to prevent their being broken off by the mass of fruit. The picture of a part of one plant (Pl. VI, fig. 2) is not exceptional. The first ripe fruit was picked August 1. The tomatoes were large and shapely. Naturally the first fall frost on August 26 found most of the fruits still green, but by hanging the vines in a moderately dry, warm place, all ripened and were usable, though inferior in flavor to those ripened normally.

Parsnips, beets, and carrots.—A fall seeding of these vegetables made in 1915 came up rather irregularly the following spring. The beets did no better than those sown in the spring, running badly to seed; but the parsnips and carrots were a great success, producing fine large roots 3 inches in diameter, Hollow Crown parsnips and James's Intermediate carrots being the varieties used. A few parsnip roots set out this spring produced some fine ripe seed. In a neighbor's garden parsnips left out all winter this season threw up seed stalks 5 feet high, about 50 per cent of the seed ripening.

Turnips.—Eight crates of Petrowski turnips were planted on a knoll April 26. Nearly every root grew and by June 1 the knoll looked like a big bed of yellow flowers. By August 1, 75 per cent of the seed had been gathered. This cutting, in addition to a later one, yielded 100 pounds of first-class seed.

Strawberries.—The Sitka hybrid strawberry plants passed through their third winter successfully. Several hundred young plants set out this spring have made a good growth, produced runners, and set new plants freely. The old plants ripened about a pint of medium-sized fruit picked July 14, the birds and dry weather having considerably reduced the quantity of fruit. No. 275 was most prolific, followed by Nos. 94, 1503, and 320, all the berries being well colored and well flavored.

FLOWERS.

In order to induce early bloom, 16 flats were seeded to flowers between February 28 and March 3. From these flats the plants were, when of the proper size, transferred to individual tins. The first transfers were made to the outside beds May 15, beginning with carnations, as they are hardy, sometimes living through the winter here, and following with pansies. From then until June 1 between 500 and 600 plants were set out. A pansy plant was the first to bloom May 31, and by the middle of June bouquets were being cut from the pansy bed. On June 16 snapdragons were in bloom, and three days later a bed of coreopsis, the latter growing to a height of 4 feet with a mass of feathery yellow blossoms. A bed of petunias made a rank growth and was in profuse bloom from June 21 until the first heavy freeze, October 12. Pansies, snapdragons, dianthus, larkspur, French marigolds, and Shasta daisies were equally frost-resistant and free-blooming throughout the season. A few plants of scabiosa put out for trial proved so successful in point of both beauty and hardiness that a whole bed of them will be grown next year. Many other varieties, 36 in all, of flowering annuals and ornamentals were grown, including asters and both cactus and collarette dahlias. Shirley and California poppies, sweet alyssum, candytuft, and mignonette were seeded in the fall and were up by May 11, all making a splendid, decorative growth. Though seed houses advise against transplanting mignonette and poppies, both were reset here while budded without any deterioration whatever. Plans are under way for next year to grow about 70 varieties of flowers. Cosmos is the only annual tried thus far that has not produced satisfactory bloom before being injured by fall frost.

REPORT OF WORK AT FAIRBANKS STATION.

By J. W. NEAL, *Assistant in Charge.*

The work at the Fairbanks Station follows the line of general farming and seed production, together with a limited amount of small plat work for testing new grains and for increasing seed of special varieties that have proved hardy here and at the Rampart Station.

The snow left the fields reasonably early in the season of 1916, but owing to the excessive rains late in the previous fall, the ground was so wet when it thawed out in the spring that the seeding was held back later than last year by several days even on the most favorable southern slopes, while the more level fields and the northern slopes remained wet far into June, making the seeding of the hay crop very late, and one 25-acre field remained wet too late to be planted to any spring crop. Altogether about 50 acres was in crop this year.

All May seedings matured good seed. The field seed crops were all thrashed and sacked before freezing weather came on, while the small varieties were stored in the shed to be thrashed during the winter. The several varieties thrashed totaled probably 600 bushels of clean grain. Some 1,200 pounds of turnip seed was harvested early in August.

As the Government railroad work which was started in the interior this year provided steady employment for all idle men in the country, it was difficult to obtain sufficient help to harvest the crops. Therefore, no new work and no clearing were undertaken. The mosquitoes were so abundant in the fields during the early summer, that few acres were summer plowed. As teams were scarce for the same reason that labor was scarce, it was possible to hire only one team for the harvest and fall plowing. However, a later freeze-up than usual permitted plowing until October 15, and as an extra three-horse team was found available for the last five days of plowing, the summer and fall plowed area was increased to 75 acres.

The station continues to attract the usual interest among tourists and occasional travelers from the States and other countries.

CLIMATIC CONDITIONS.

Agriculture being at all times at the mercy of the weather, rain, sunshine, and warmth are the factors that count most for success. As stated in a former report, observations have proved that when one year is compared with another there is a great variation in the weather conditions here, and the farmer is continually confronted with some new condition. The present season was unfavorable. The late seeding was a drawback, the dry spell in June stunted the grain on the south slopes, and finally the rainy fall interfered with the harvesting and thrashing of the grain.

The large amount of rainy weather during the hay harvest occasioned some difficulty in saving the late hay cuttings. The sheaves of grain were set in small uncapped shocks, which would dry out quickly after a rain.

The rainfall for the growing season of 1916, May 1 to September 30, totals 9.56 inches. The number of full clear days covering that period was 26, with 37 cloudy and 90 partly cloudy days. The latest frost occurred on May 28 with the temperature at 31° F., while the temperature in the fall fell to 32° F. for the first time on September 3, with other light frosts on September 8 and 11 to 13, none of which injured the station crops. Though potatoes in the lowlands were killed early in September, those at the station and in the hilly region remained green late in the month, much of the crop being out of the ground before the vines were actually frosted down.

For the benefit of those who may wish to compare the weather records for a few years back, the following table has been prepared:

Summer weather records of Fairbanks Station.

Month.	Number of days.			Temperature.		Monthly rainfall.
	Clear.	Cloudy.	Partly cloudy.	Maximum.	Minimum.	
1914.				° F.	° F.	Inches.
May.....	5	11	15	70	5	0.59
June.....	5	5	20	89	35	1.51
July.....	1	6	24	79	37	4.63
August.....	3	12	16	76	30	2.06
September.....	5	14	11	66	17	1.36
Total.....						10.15
1915.						
May.....	14	1	16	81	21	.....
June.....	6	10	14	95	35	1.80
July.....	10	5	16	88	37	1.68
August.....	7	12	12	80	34	3.24
September.....	3	14	13	64	25	3.12
Total.....						9.83
1916.						
May.....	5	7	19	75	18	.95
June.....	5	7	18	92	36	2.16
July.....	7	7	17	85	40	2.31
August.....	7	4	20	83	29	2.72
September.....	2	12	16	69	26	1.42
Total.....						9.56

The lowest temperatures for the last three winters were -34° F. for 1914, -47° for 1915, and -60° for 1916; the snowfall, 47.5, 47.5, and 56 inches, respectively.

Seeding began on May 15, 11 days later than last year's seeding, but 7 days earlier than that of 1914.

The daily temperatures ranged from 42° to 48° F. during the last of March, reaching 60° F. on April 5, with the maximum temperature above freezing every day in that month. The nightly temperatures, however, fell to freezing and slightly below for the whole month of April and for the first 12 days in May, except May 1, when the minimum thermometer registered 35° F. With these extremes, the snow softened rapidly and practically disappeared from the

fields early in April, indicating an early spring. The cold nights, however, held the snow in low and less exposed places until May 15, when the last vestige disappeared from the north slopes. As stated above, the ground was very wet when it froze in the fall of 1915. As a consequence the spring thaw left the ground full of water, requiring some time to drain out sufficiently for cultivation.

WINTER GRAIN.

Five varieties of winter rye, 1 of winter wheat, 4 of spring wheat, 1 of buckwheat, 1 of spring rye, 6 of oats, and 3 of barley ripened in field plats. As previously stated, some 600 bushels of grain was thrashed from these several varieties.

Department seed of Wisconsin Pedigree No. 3 winter rye planted July 14, 1915, made an excellent fall growth, but less than 50 per cent lived through the winter, which stooled well enough, however, to make a fair stand. Heading began June 10. The crop was ready to harvest by August 7 and was cut five days later. The heads were fair sized and well filled, the straw 64 inches in height. A planting of department seed of Wisconsin Pedigree No. 2 winter rye was made July 14, 1915, producing a heavy fall growth scarcely 50 per cent of which lived through the winter. With good stooling, this amount made a fair stand, which began heading June 11. The crop, ripe by August 7 and harvested five days later, had large and well-filled heads, with straw 60 inches tall.

Station seed of the sixth generation of winter rye No. 19556, seeded July 14, 1915, made a very fine fall growth, probably 70 per cent wintering, stooling well, and producing a good stand. (Pl. VII, fig. 1.) Heading began June 10. The crop, ripe by August 2 and harvested a few days later, had large and well-filled heads, and though the crop has not been thrashed, the yield promises to be as good as in any previous year. In 1914 this variety thrashed at the rate of 25 bushels to the acre, and in height it lapped over the head of a tall man.

Hogot winter rye, No. 3 Department seed, was planted July 14, 1915, making an excellent fall growth. Not over 30 per cent wintered, but this stooled very well and produced a moderately fair stand, which began heading June 14. The crop, ripe by August 8 and harvested on August 12, had fairly large and well-filled heads. The growth in height was 62 inches.

Station seed of the sixth generation of fall rye seeded July 14, 1915, made a fine fall growth, not more than 40 per cent of which wintered, but this stooled out fairly well and made a moderately even stand, beginning to head June 10. The crop was ripe and harvested August 2. The heads were fair sized and very well filled, the straw 70 inches tall.



FIG. 1.—WINTER RYE, FAIRBANKS STATION.



FIG. 2.—HYBRID BEARDLESS BARLEY, FAIRBANKS STATION.



FIG. 1.—H. G. SPRING WHEAT, FAIRBANKS STATION.



FIG. 2.—ROMANOW SPRING WHEAT, FAIRBANKS STATION.

Station seed of the sixth generation of Kharkov winter wheat seeded July 14, 1915, made a fair fall growth, but less than 50 per cent wintered. This variety was on thin lowland and stooled very little, making a very light crop. The straw was coarse, about 34 inches long, and bore very large, well-filled heads. The crop was ripe by August 20.

SPRING GRAIN.

A May 15 seeding of station seed from the second generation of H. G. spring wheat originally obtained from Tulun, Siberia, began heading June 26, a large percentage ripening by August 7. It was badly lodged by wind and rain about the time it ripened, making it necessary to cut it one way with the binder on August 16 and 17. The straw reached a height of 42 inches. The plat of this variety, comprising $1\frac{3}{4}$ acres, yielding 50 bushels, or at the rate of 36 bushels per acre, of good clean grain. (Pl. VIII, fig. 1.) This wheat has ripened every year since the first seeding three years ago. In 1914 this station received a half-teacupful of the wheat, which, when seeded and ripened, yielded 9 pounds. All of this, seeded thinly in 1915 with a hand drill, thrashed 11 bushels after a considerable amount had shattered in handling the crop, the harvest having been long delayed by rainy weather. About 4 bushels of this seed has returned about 50 bushels, as noted above. Earliest-maturing heads from the 1915 crop were selected and seeded separately, but there was no perceptible difference in the dates of ripening.

Station seed from the first generation of Russian spring wheat No. 36, originally from the Tulun Station, Siberia, seeded May 19, began heading June 29. The crop ripened by August 10 and was harvested on August 12, having made a growth of 38 inches in height. Earliest-maturing heads from the 1915 crop, seeded separately, showed a slight advance in point of ripening. There is apparently no difference between this variety and the H. G. spring wheat received from the same station.

Romanow spring wheat (station seed from the sixth generation) was seeded May 16, began heading July 1, ripened August 13, and was harvested August 18. (Pl. VIII, fig. 2.) The crop was not weighed this year, as a portion of the plat became foul with volunteer oats, but the 1916 crop is thought not to have fallen much below the yield of 40 bushels per acre indicated by the crops from this variety in other years. Seeded regularly at the station for several years, this wheat has matured perfectly for the past three seasons. As stated in a former report, this grain volunteered in a barley crop several years ago. The barley has been ripened and thrashed every year since, almost every bundle of barley containing a few heads of ripe wheat. Seed from this barley has been distributed among the

local farmers, one of whom picked out enough of the wheat kernels from the barley to produce a prize-winning bundle for the Valley fair this year. This is a bearded wheat with brown chaff, large heads, and rather long straw, and though not the earliest maturing variety grown at the station by a few days, it gives the appearance of a better grade of wheat than the earliest.

Marquis spring wheat, station seed from the first generation, seeded May 16, began heading June 29. This variety was laid flat by wind and rain before it had fully matured, which retarded ripening by several days. Still the crop was ripe by August 20, and cut one way with the binder to very good advantage. A scant half-acre of this wheat yielded 18 bushels of thrashed grain.

Station seed from the fifth generation of buckwheat, seeded May 16, began to blossom June 28. The grain, ripened and harvested August 20, made the usual excellent growth and good yield. A small tract planted last year and left to volunteer, made quite as good a crop as the plat seeded this year. It should be stated that the volunteer crop was on stubble from a cradle harvester, which scattered enough grain for a good seeding. The point worthy of notice is that this stubble was plowed under late in the fall and harrowed in the spring, which indicates that late fall seeding might be practiced. The volunteer crop came up irregularly owing to the uneven depth of the seed. Seven sacks, or 15 bushels, were thrashed from two small plats of about one-half acre.

Gesselberg spring rye of station seed from the second generation, originally from Tulun, Siberia, was seeded May 19, beginning to head June 24. Ripe by August 6 and harvested six days later, the crop was rather light, with small heads and straw about 48 inches in height.

Hybrid barley No. 4 A1 from station seed of the second generation (originally from Rampart Station), seeded May 18, began heading June 29, ripened by August 10, and was harvested six days later. (Pl. VII, fig. 2.) This variety is a rank grower and a good yielder. It is a beardless type originating from bearded parentage, and while from 10 to 15 per cent of the heads of this crop still had beards it is expected that by careful selection it will soon become a pure beardless variety. Each year great care is taken to cull out all bearded heads before the seed is thrashed out.

Hull-less barley No. 19851, from station seed of the fifth generation, was seeded May 17, began heading July 1, ripened, and was harvested on August 9, yielding 9 bushels of grain. The rather steep south slope on which this seed was sown, and the dry, hot weather of late June caused a short growth of straw and a lighter yield than usual. This variety has formerly yielded 1,825 pounds to the acre under more favorable conditions.

Beardless barley No. 19852, seeded on May 17 from station seed of the fifth generation, began heading June 28, ripened August 3, and was harvested on August 8. As this seed also fell on a steep south slope and suffered from the dry heat of late June the straw was short and the yield much lighter than usual. A larger tract on a north slope, seeded to this variety on May 20, made the normal growth of 4 feet and produced a good yield of seed, which was overripe when the grain was cut August 26. Altogether about 60 bushels of grain was thrashed from the two tracts, which yielded at the rate of about 25 bushels to the acre.

Canadian oats No. 444, of the second generation of station seed, which came originally from the California Station, was seeded May 18, began heading July 3, and ripened August 10, producing a growth 50 inches in height with heavy heads. This crop was badly lodged by the storm, and as the plat was too small and too close to adjoining plats to be cut one way with the binder, it was harvested with the reap hook as time permitted. The plat of one-sixth acre yielded 320 pounds of thrashed grain, or at the rate of 60 bushels per acre. This is a clean, white oat, a little later in maturing than some of the other varieties grown at the station but a reasonably safe crop and a good yielder.

Station seed from seventh generation of Sixty-Day oats, seeded May 17, began heading June 28, ripened August 2, and was harvested on August 8. (Pl. IX, fig. 1.) As this seed fell on a steep south slope, where the ground became very dry in June during a hot spell of weather, the crop made an unusually short growth, being barely long enough to pick up with the binder. A 2-acre tract yielded 70 bushels of thrashed grain.

Finnish Black oats, seeded May 17 and 18 from station seed of the seventh generation, coming originally from Finland, began heading June 30. The crop ripened and was harvested August 9. (Pl. IX, fig. 2.) This seeding, comprising a 4-acre tract on a rather steep south slope, had much shorter straw than usual, making only about 40 inches growth, while later seedings for the hay crop on flat land and on north slope land stood shoulder high over most of the field. The 4-acre tract thrashed out 167 bushels. A 5-acre tract of south slope land in another section was seeded May 27 to the same lot of seed of the same variety, the crop being harvested August 29. This tract yielded only 150 bushels of thrashed grain, or 30 bushels to the acre, a poor crop, as this variety of oats has commonly yielded from 60 to 90 bushels per acre in former years.

Hansen oats No. 278, from Rampart Station, was seeded May 31, having just then been received, and began heading July 14. This

variety, sown on a gentle west slope, made an exceptionally rank growth, standing 6 feet in height all over the plat. As the seeding was late, the growth rank, and fall rains heavy, the grain matured slowly and unevenly. The crop fell flat and had to be cut with the reap hook the middle of September. The straw was quite green, but the grain was practically ripe. The heads are long and heavy. It should make a big yield. The crop was stored in the sheaf, to be thrashed during the winter.

New Swedish oats (pedigree No. 0-314-1) received from Rampart Station and seeded May 31, began heading July 17 and ripened by September 7. This variety made a growth of 52 inches in height. The sheaves were stored in a shed to be thrashed during the winter, but it is thought that the yield will be good.

South Dakota oats No. 637 (pedigree No. 0-116-4) was received from Rampart Station on May 31 and seeded on the same day, beginning to head July 10 and ripening the last week in August. The growth was 4 feet in height, and, though the crop has not yet been thrashed, the yield is expected to be very good.

The last three varieties above named are from seed tried at Rampart Station and sent here for seed increase. It is to be regretted that this seed arrived too late to be seeded with the main crop for early maturing and for better comparison with promising varieties already tried at this station.

The following table is submitted for easy comparison of several grains that have regularly matured for several years:

Comparative growth and yields of different varieties of spring and winter grains.

Varieties.	Date seeded.	Stand.	Date of appearance of first heads.	Date of ripening.	Number of days to mature.	Height.	Yield per acre.
						<i>Inches.</i>	
Winter rye:	1915.						
Wisconsin Pedigree No. 3....	July 14	Fair....	June 10	Aug. 7	389	64	Fair.
Wisconsin Pedigree No. 2....	..do....	..do....	June 11	..do....	389	60	Do.
No. 19556.....	..do....	Good....	June 10	Aug. 2	384	75	25 bushels.
Hogot No. 3.....	..do....	Poor....	June 14	Aug. 8	390	62	Light.
Fall rye.....	..do....	Fair....	June 10	Aug. 2	384	70	Fair.
Winter wheat: Kharkov.....	..do....	Thin....	.....	Aug. 20	402	34	Light.
Spring wheat:	1916.						
H. G.....	May 15	Good....	June 26	Aug. 7	84	42	36 bushels.
Russian No. 36.....	May 19	..do....	June 29	Aug. 10	83	38	Good.
Romanow.....	May 16	..do....	July 1	Aug. 13	89	48	Do.
Marquis.....	..do....	..do....	June 29	Aug. 20	96	50	36 bushels.
Buckwheat.....	..do....	..do....	June 28	..do....	96	36	30 bushels.
Spring rye: Gesselberg.....	May 19	Fair....	June 24	Aug. 6	79	48	Light.
Barley:							
Hybrid No. 4 A1.....	May 18	Good....	June 29	Aug. 10	84	40	Good.
Hull-less No. 19851.....	May 17	..do....	July 1	Aug. 9	84	30	30 bushels.
Beardless No. 19852.....	..do....	..do....	June 28	Aug. 3	78	48	25 bushels.
Oats:							
Canadian, California No. 444..	May 18	..do....	July 3	Aug. 10	84	50	60 bushels.
Sixty-Day.....	May 17	..do....	June 28	Aug. 2	77	24	35 bushels.
Finnish Black.....	..do....	..do....	June 30	Aug. 9	84	40	41 bushels.

ALFALFA.

The following varieties of alfalfa, seeded in 1915, all wintered and made a very fair crop this year:

Orenburg, seeded June 22, 1915, wintered a fair stand and showed the first blossoms this year on July 4. Seed pods were forming by July 22, though no seed fully ripened. This variety made a rather spreading growth.

Hansen's Semipalatinsk, seeded June 12, 1915, wintered a very good stand. The first blossoms this year appeared on July 1, and seed pods were forming by July 21, though only a few scattering pods matured seed. This variety made a vigorous, spreading growth.

Hardy Grimm, from Whitewood, S. Dak., seeded June 22, 1915, produced the first blossoms this year on July 6, with the first seed pods forming by July 22. No seed fully ripened, and the growth, upright in character, was only fair.

North Swedish, Hansen's Chernob, and Hansen's Cossack, seeded June 12, 1915, had blossoms this year on June 30. Seed pods were formed by July 18, but few seeds ripened. All three varieties made a vigorous upright growth.

CLOVER.

Late in May small plats, each of red and white clover, were sown about the residence grounds, this being the only clover seeded this year. Both varieties were blooming by July 14. Being seeded for lawn purposes, these plats were given little attention, but both made a very pleasing appearance. White and alsike clovers commonly stand the winters, but red clover at this station has usually winterkilled completely. Red clover seed has been received for seeding several acres next spring as a green manuring crop.

THE HAY CROP.

About 25 acres was seeded to oats and barley for hay on soils that had remained wet too late for a seed crop. A late seeding naturally makes the hay harvest late, usually throwing it at a time when the fall rains often prove detrimental to haymaking. This year the situation was indeed trying, as much of the hay stood in the shock several weeks before it could be stored in the barn or stacked in the field. Probably two tons represents the actual loss, as about that amount was too much molded for feed. The 25 acres made 35 tons of dry hay, which is considered a good crop in this country. Probably 25 tons got to the barn in very good condition.

Some Alaska farmers pile their hay crop on pole racks in the field a day or two after it is cut down, where, unless the rains are exces-

sive, it cures very satisfactorily. This practice has been employed at the station in a small way with some success. Several tons are now on such racks in the field, and this will be hauled in and fed during the winter.

THE TURNIP-SEED CROP.

To produce material for the Alaska seed distribution, 218 bushels of turnips, selected from a crop of 400 bushels, was taken from the cellar and set in the field from May 21 to May 26. A good stand was obtained and blossoms were appearing by June 10. Cultivation continued at regular intervals as far into the season as stem growth would permit. The crop ripened much more evenly than did the 1915 crop and when seed harvesting began July 31, probably 90 per cent of the plants were ripe enough to cut at the first gathering. The harvest was rather tedious, as the entire crop had to be handled on canvas. More than 200 pounds of seed was cleaned up which had been shattered in handling the crop. The stems are quite green long after the pods have ripened and begin to pop open, making it necessary to get the crop on canvas as soon as possible. It was also found necessary to rack the stems up on several layers of poles in a big shed, with canvas under the bottom tier to catch the seed shattered in handling and while the stems were drying. Altogether a great amount of labor is entailed in handling a large crop under the Alaska conditions. At the second gathering, made early in September, very few stems were still too green to harvest. Owing to the unusual pressure of the fall work the bulk of the crop has not been cleaned as yet, but it is estimated at 1,200 pounds of clean seed. One bushel of specially selected turnips, set in the station garden for seed improvement by selection, made 11 pounds of clean seed. From $1\frac{1}{2}$ acres seeded to turnips from station seed of the 1915 crop, 500 bushels of turnips was pulled, topped, and stored in the station cellar, of which about 100 bushels was culled out for immediate hog feed. The remaining 400 bushels is reserved for the 1917 seed crop, in the event that more seed is desired. Due to lack of help, one or two hundred bushels of turnips was left in the ground.

POTATOES.

In the interior potatoes continue to be the money crop for the farmer. The acreage devoted to potato culture has gradually increased until the production in 1915 considerably exceeded the consumption. As the 1916 acreage was naturally reduced and as the yield per acre on most farms was considerably less this year, there is now evidence of a shortage with indications of much higher prices before potatoes can be imported from the States or another crop raised. At this time potatoes are in sharp demand at 6 cents a pound, while the farmers are already talking double acreage for next year.

The station potato crop consists of about 250 bushels of 25 varieties, two-thirds of which were raised on north-slope land for hog feed. Very small amounts of 11 varieties from Rampart Station were planted on June 3 for trial and for comparison with the yield of the different varieties that have been under culture at this station for several years. These Rampart potatoes, all planted on the same day and in one large plat, and beginning to blossom between July 18 and 25, were attacked by a stem blight late in August. An attempt was made to pull out and destroy all diseased plants, but the disease spread so rapidly that all varieties were soon more or less infected and the work was abandoned owing to the pressure of the grain and hay harvest. The experiment was thus lost, as the thinning out rendered it quite impossible to make any accurate comparisons other than by the hill method, which can not be used here, the potato crop being dug by machine. This same stem blight also occurred on some of the nearby farms.

Results from an experiment with commercial fertilizers also interrupted by the appearance of this blight at the station, were not recorded except that most hills in the fertilized rows showed a noticeably better yield. A neighboring farmer who used commercial fertilizer on his potatoes this year at the rate of 350 pounds per acre, applied with a planter with a fertilizer attachment, dug 6 tons of potatoes to the acre, the general average for the country being below 4 tons. The farmer gives the fertilizer credit for the big crop, and states that he intends to apply even more next year.

The 11 varieties from Rampart Station are Irish Cobbler, Early Six Weeks, Rural New Yorker, Burpee's Superior, Knowles's Big Cropper, Carman No. 1, Dakota Red, Bliss's Triumph, Million Dollar, Epicure, and Noroton Beauty. The varieties of this station were given in table form in the 1915 report, showing the rate of yield in that year. Some 20 varieties were received from the Sitka Station in the fall of 1915, most of which rotted during the winter, a few small tubers being obtained from 9 varieties, as follows: First Early, Good Times, Bovee, Admiral Dewey, Burpee's Extra Early, May King, Pride of the South, New Queen, and Uncle Gideon's Quick Lunch. Some 10 or 12 new varieties were received from the Sitka Station late in the fall of this year.

For some years the potato crop, both at the station and among the local farmers, has been more or less infected with potato scab, which is frequently accompanied by a potato rust sometimes covering practically the whole tuber. Frequently every tuber in a hill will be covered with both scab and rust, but usually a very rusty-coated tuber will have less scab infection than a less rusted one. Though every year clean seed is selected for the station crop and

treated with formaldehyde solution, still the infection seemed to increase, especially in the very moist spots about the field. The seed for the last crop was soaked for two hours in a 1 to 30 solution. This long dipping must have checked the disease, for the crop is nearly free from scab this year. One variety from Rampart, the Rural New Yorker, showed considerable scab on the new crop.

THE GARDEN.

Since every report so far issued has been filled with accounts of success with vegetable growing in interior Alaska, it seems very natural to say that the last season was no exception. The only thing new about the station garden is that a dozen hills of summer squash were planted and a small tubful of squashes raised, the largest of which were enough for one mess for a small family. Ripe tomatoes from the hothouse were picked on July 14, the first cauliflower from the garden was cut July 10, and the first cabbage July 15. Green peas and beans were ready for table use the last week in July. Rhubarb made the usual enormous growth. Some of the gardeners in Fairbanks raised a considerable amount of green corn and found ready sale for the little ears at the rate of \$2 a dozen. Some very fine specimens of this corn, exhibited at the Valley fair in Fairbanks the first week in September, were 6 to 8 inches long, quite slender, and well filled with hard grains.

The few wild red raspberries set in the station garden last year, as mentioned in the last report, bore abundantly this season, which furnishes further evidence that, to a limited extent, this berry could be made to add considerable revenue to the farm or garden. The clean wild berries from the woods bring 50 cents a pound, though in the wild state the berry is usually small and often wormy. With cultivation, this berry is much improved in size and appearance.

The eight varieties of hybrid strawberries from the Sitka Station have passed the second winter. While a number of the old plants were winterkilled each year, the ground was completely covered with young plants where the runners were not cut back. Probably 1,000 plants were distributed among several settlers and gardeners this season, and late this summer about 1,200 were set out in culture blocks. The old beds were blooming by June 15, but a dry hot spell during the blossoming period practically ruined the crop, only a few small berries maturing. Late in the summer the writer visited a garden in Fairbanks which had received some of the plants distributed in the spring. These plants, set out in a cold frame with very rich soil and watered freely, had made wonderful growth and ripened several berries as large as plums.



FIG. 1.—SIXTY-DAY OATS, FAIRBANKS STATION.



FIG. 2.—FINNISH BLACK OATS, FAIRBANKS STATION.



FIG. 1.—HAYING CAMP, KODIAK STATION.



FIG. 2.—LOADING HAY, KODIAK STATION.

FLOWERS.

The station flower beds received little care this season, owing to a shortage in help, but still the station yard was much praised for its beauty. Pansies, poppies, marguerites, marigolds, petunias, asters, snapdragons, daisies, sweet peas, canary vines, candytuft, gypsophila, and red clover made a splendid color scheme for which two small lawns and a miniature forest of summer cypress (*Kochia scoparia*) furnished the necessary green background.

STOCK RAISING.

The only live stock kept by the station includes one team, a colt, and a few hogs. It remains to be proved that under present conditions stock of any kind can be raised in this part of Alaska at a profit. Take, for illustration, the cost at 4 years old of the colt above mentioned, which was foaled at this station June 13, 1914. At the farm oat hay has a selling value of \$50, and grain \$90, per ton. Even allowing that the colt might, with a little grain feed, rustle its living 4 months in the year, at 4 years old it probably will have consumed 10 tons of hay and, at the least, 2 tons of grain, or \$680 worth of feed, counting nothing for the care of the animal. It is doubtful whether \$800 would cover the actual expense of raising this colt to a working age on feed bought at market prices.

The station hog herd has been reduced from nine to six breeders. Two young male pigs were recently sold for breeding purposes, and the remainder of the herd not reserved as breeders sold for meat. Two demands for male pigs last summer had to be refused, as the whole herd had become infected with scab (sarcoptic mange). Continued treatment with lime-sulphur and also with oreolin solutions seems to have overcome the disease in the pigs, as evidenced by the condition of 12 small shoters recently butchered. The two male pigs were sold at the purchasers' risk, they being duly informed of the scab situation.

In the last annual report, the unprofitableness of hog raising at this time was set forth. On the whole, the business of hog raising among the farmers has been materially reduced. There is practically no demand for breeders and none for any special type of hogs. However, each farmer takes his turn in demonstrating to his own satisfaction that hog raising for him is a losing game. About the only hogs now in this district are a few kept by the gardeners to eat up the vegetable culls and a small herd or two fed the slop from the town restaurants. Mr. William Young, who has been longest engaged in hog growing in this region, has condemned hog raising, except for using up the surplus products from his dairy and the vege-

table trimmings and culls from his garden. Mr. Young now keeps two brood sows, whereas he had 75 to 80 hogs seven years ago. The fact is that in all kinds of stock raising in the interior, feed, at present prices, is too high for profit. The actual cost of producing the feed is more than the animal will bring on the market. Conditions will have to change materially before stock raising here will reach the profit point to the farmer. One farmer who has recently killed all his hogs claims that the meat cost \$1.25 a pound. Another farmer said his pork cost him \$1 a pound. The meat market in Fairbanks pays 28 cents a pound for dressed pork and retails it at 30 to 50 cents, a price based on the cost of the imported product.

The station herd when received in 1914 consisted of four yearlings and two 2-year-old hogs. The first-year litters all died. The second litters, less four reserved for breeders, sold for \$337.68, while the third years' sales, including two old hogs and four yearlings with the young shotes, brought \$575.20, making a total of \$912.88, with three old hogs and three pigs from the 1916 litters constituting the present herd. During this period the herd has consumed imported feedstuffs worth \$968.81, station-grown grain at a selling value of \$112.50, 400 bushels of turnips, and 800 bushels of potatoes. Allowing \$1 a bushel for the cost of producing the potatoes and 50 cents a bushel for the turnips (which includes topping and storing), a very low estimate, the total cost of feedstuffs consumed by the herd amounts to \$2,081.31, to say nothing of labor and the buildings and fuel necessary in a cold climate.

THE MARKET.

As has been set forth in a former report, the market of interior Alaska is very limited, there being practically no outlet for surplus products. The prospective settler should make a thorough study of the conditions before actually settling, if he expects to make his living from the start. The market conditions have changed in some measure in the last year or two. The native potato having finally superseded the imported product, very few potatoes have been shipped into the country in the last two years. As the Government railroad work has opened up a market for a considerable tonnage of potatoes and other garden stuff, the merchants have found it profitable to ship a small amount to the lower river camps. The fact that last year's potato crop was not all used up so discouraged some of the potato growers that they cut down their potato acreage considerably, as mentioned on page 46. This condition, together with an increase in the demand, has created an apparent shortage of potatoes. Prices in the spring of 1917 are already advancing to an alarming degree, but the situation can not be relieved until some time after navigation opens.

To the settler who has the means for extending his clearings, the hay market offers some inducements. While most of the freighters prefer timothy hay, on account of the neatness of the bale and less waste in feeding, there is always more or less demand for oat hay, perhaps due to the difference in price. Oat hay sells for \$50 a ton while timothy (imported) is \$90 per ton.

On the farm, poultry might be raised at some profit, or as a means of turning into cash certain parts of the crop that might otherwise be wasted. Some of the largest poultry growers, however, have cut their flocks down materially on account of the high cost of feed.

Several thousand cases of eggs are consumed annually in the Fairbanks district, a very small percentage of which are produced here. The summer shipments sell for \$15 to \$18 a case, while those hauled in from the coast on the snow sell for \$28 to \$35 a case. Local ranch eggs commonly sell for \$2 a dozen in winter and \$1 in summer.

SOIL IMPROVEMENT.

In a country where the soil remains in a frozen state for more than half the year, the annual cropping will very soon use up the immediately available plant food, after which it becomes necessary to let the land rest or to resort to fertilizers to maintain good crops. The crop-rotation system will, in time, no doubt, aid in solving the problem of soil maintenance, but at present the farmer has so few acres cleared that if his living must come from his land, he is forced to grow crops selling for the most money, the most profitable being potatoes in all cases where the land is suitable for that crop. For the present the only other crop on which money can be realized is hay, and the income from a few acres of hay is indeed small. It has been demonstrated that, in a grain and potato rotation, the grain crop will be improved, but that the potato crop following grain, especially oats, is materially lessened. The safest method seems to be to fallow the potato ground about one year in three, or, a clover, rye, or buckwheat crop might be turned under as green manure every third or fourth year. If the soil is plowed early and cultivated two or three times during the off year, the following crop of any kind is much improved. When the farmer can extend his clearings to sufficient acreage, he can probably follow a crop rotation using potatoes one year, hay or grain the second year, and some green-manure crop the third year, then back to potatoes. This method no doubt will keep the potatoes freer from diseases than where the crop is grown two or three years in succession on the same ground.

It has been demonstrated that soil responds readily to the use of commercial fertilizers. At the station the crop has been much improved by the use of both nitrate of soda and nitrate of lime. In

more than one instance, the crop has been doubled by the application of 200 pounds of nitrate of soda before harrowing at seeding time. Fully as good results were obtained with nitrate of lime in all but one instance where during the last season a third of a certain plat seeded to oats for hay was fertilized with nitrate of lime at the rate of 150 pounds per acre, another third received this fertilizer at the rate of 300 pounds per acre, and a similar portion of the plat was left without fertilizer. The two fertilized strips gave about the same crop, probably 1 ton of dry hay to the acre, while the unfertilized strip gave more than double that yield. It might be well to state that this ground was plowed in July of last year and prepared for fall grains, but the seed at hand did not cover the whole plat. The rest and summer cultivation probably account for the heavy crop on the unfertilized strip, while the nitrate of lime on the other strips doubtless stunted the crop during a very dry, hot spell of weather soon after the grain had come up.

SEED DISTRIBUTION.

The station ripened 260 pounds of turnip seed last year for distribution throughout Alaska, 240 pounds of this seed being sent to the central station at Sitka for general dissemination and 20 pounds being retained here for those who commonly apply to this station for seeds. Some 30 applicants were supplied with small amounts of grains of several varieties, in all about 9,500 pounds, and a few hundred pounds was sent to the Sitka Station for similar use among the settlers in the Matanuska Valley and along the coast.

In the Fairbanks district the farmers have depended on commercial grains with which to seed their fields. Owing to a shortage of seed grain in the stores last spring many of the farmers applied to the station for seed. While the station had thrashed upward of 1,200 bushels of grain the last year, the surplus would not have supplied the demand, if offered for sale.

To encourage the farmers to raise their own seed and, at the same time, to give them a start in producing the early and hardy grains that have ripened regularly at the station for the last five years, and also to promote the cause of agriculture in Alaska, the writer obtained permission from the Department to lend surplus seed to the farmers in the local district for a cooperative seed demonstration test. An announcement was made in the local papers, and 15,000 pounds of seed in four varieties was prepared for this service, allowing 350 pounds each for 43 farmers. About 52 applications came in, but only 31 farmers accepted the terms of the contract, which provided that the seed be sown as early as was consistent with good cultivation, that all grain be thrashed that would mature under natural

conditions, and that pound for pound of seed be returned to the station in the fall with certain crop data. Some of these applicants, not having ground for the full allotment, did not draw the whole 350 pounds. However, 9,500 pounds of seed was issued to 31 farmers, including 5,200 pounds Finnish Black oats, 2,100 pounds Sixty-Day oats, 1,475 pounds Beardless barley No. 19852, and 725 pounds of Hull-less barley No. 19851.

Unfortunately the soil this year remained wet very late on most of the farms, and the late seedings did not ripen. The writer has visited 17 of these farms, and found that seedings ranged from May 20 to July. Ten of this number have ripened at least a portion of the crops. Four of these had thrashed their crop, showing a yield of from eight to fifteen times the amount of seed sown. It is known that at least 3 of the 14 not visited have ripened their full crop. While the hoped-for results have not been fully attained, a certain amount of enthusiasm has been aroused, and many farmers who failed to ripen their crop or did not realize the importance of early seeding are now bartering with their neighbors for some of their seed for another year, at a slight premium over common grains sold in the Fairbanks market.

REPORT OF WORK AT KODIAK LIVE STOCK AND BREEDING STATION.

By M. D. SNODGRASS, *Assistant in charge.*

Climatic conditions have more to do with agricultural development in this region than any other factor and therefore first to secure attention. The winter months were dry, cold, and windy, with frequent heavy westerly gales, often lasting for several days. There were 38 clear, 44 cloudy, and 40 partly cloudy days, with a precipitation of 8.03 inches, during the period from December 1, 1915, to March 31, 1916. During December and January there was only 7.8 inches of snow and 1.05 inches of rain. The chief snowfall for the year came during February, March, and April, with 41 inches for the three months, as compared with a total of 54.3 inches for the year. At no time was the snow on the ground more than 11 inches deep.

Low and mean temperatures for the four months were: December, low 13° F., mean 30.6°; January, low 7° F., mean 30.4°; February, low 4° F., mean 28.8°; and March, low 12° F., mean 28.2°. While the temperature never fell to zero, the mean temperature was lower than normal for the whole period. The raw cold winds of March were very disagreeable to man and beast.

April, May, and June were cold and very backward, there being only 12 clear days, as against 55 cloudy days during the three months.

During the first three weeks of April 16.5 inches of snow fell, but did not stay long. Though precipitation was about normal for this period, the frequent lack of sunshine greatly retarded the growth of pasture grasses and crops of all kinds. Frost was out of the ground to a sufficient depth to plow on the hillsides with east and south slopes by April 27, but the ground was very wet and heavy to work with a team. Frequent rainy spells of several days' duration during May and June retarded farm work and made it impossible to get early seeding done. The mean temperature for this period was several degrees colder than normal, and this was the coldest and most backward season experienced since the station was established at Kodiak. Vegetation had made slow growth and the prospects for field crops were very unfavorable up to June 30. July weather was more favorable for growing vegetation, there being only 2.45 inches precipitation, 9 cloudy days, 9 perfectly clear days, and 13 partially cloudy days during the month. The partially cloudy days usually give several hours of sunshine and are considered good growing weather. August weather was unusually cloudy, there being 22 cloudy days, 5 partially cloudy days, and only 4 clear days. The precipitation was about normal, but light rain came on 20 days and was almost continuous. The mean temperature for the month was 50.8° F., with a maximum of 68° and a minimum of 41°. Pasture and meadow grasses grew well at this time, but all cultivated crops made slow growth.

The weather made it impossible to cure hay until after August 25, when there came a short period of 9 days of fair haying weather. The grasses were so green and succulent that it required from 5 to 7 days to cure the hay sufficiently for stacking or storing in barns. September weather was characterized by frequent light showers, just enough to hinder the curing of hay. The precipitation was 2.73 inches, with 4 clear, 21 partially cloudy, and 5 cloudy days, with a mean temperature of 48.4° for the month. Pasture grasses remained green and grain hay grew throughout the month. October was damp, light showers falling nearly every day until the 28th, when the first killing frost occurred. Precipitation for the month was 7.69 inches, with 1 clear, 15 partially cloudy, and 15 cloudy days. November weather was about normal. Freezing weather set in October 28 and continued until November 10, followed by 10 days of rainy weather, which thawed out the ground. Then came freezing accompanied with light snowfall and heavy westerly winds. There were 6 clear, 12 partially cloudy, and 12 cloudy days for the month. From the farmer's standpoint, the season was most unfavorable. The late thawing of the ground in the spring, cold spring and summer, and continuous showers during August and September, made it

almost impossible to cure hay, much of which was spoiled while curing. The season was good for growing and putting up silage, as the grasses and grain remained green and succulent until late in the season. Pasture grasses were slow in coming in the spring, but made good growth and remained green later in the fall than usual.

GENERAL WORK OF THE SEASON.

The principal work during the winter months is the care of live stock, overhauling machinery, getting up the year's fuel supply, and making such improvements as the time allows.

The care of the live stock requires the labor of three men for the greater part of the time. The cattle are stanchioned for feeding night and morning, and are turned out to exercise in open lots during days when the weather is not too stormy. The cattle were weighed eight times during the winter feeding, records being kept of weights of every animal in the herd. A feeding experiment was carried on with three steer calves, while a record of the general feeding of the herd was also kept. The dairy herd was kept at Kodiak until early in February, when all but two head were transferred to Kalsin Bay, and kept there until June 20, when they were again returned to Kodiak. The move to Kalsin Bay was necessitated by lack of silage and hay at Kodiak. The work with the dairy herd was continued throughout the summer and fall until October, when it was discovered that tuberculosis existed in the herd. The cattle were then separated, all the sound cattle being moved to Kodiak and the reactors taken to Kalsin Bay to be handled according to the Bang method for tubercular cattle. The moving and segregation necessary at this time made it impossible to go on with the dairy work with all the cows used for that purpose.

The improvement work for the season consisted of clearing stones from 6 acres of farm land; rebuilding barnyard fences, building new gates, grading around buildings; building a new dam for water supply at Kalsin Bay and putting in 250 feet of pipe line; tearing out the old floors of the cattle sheds, reflooring a part, and rearranging the interior for the use of the tubercular cattle; recurring the well; and building a woodshed for the cottage at Kalsin Bay.

Two ready-cut cottages were purchased in Seattle and shipped to Kodiak for housing the assistants at Kalsin Bay and at Kodiak, but the materials came too late to be put up before winter set in. The material for one cottage and gravel for a cement foundation were hauled to the grounds, while the other was stored at the dock until spring. As the foundation materials and the plans for the buildings were not received until freezing weather was due, it was deemed unsafe to attempt the work this fall.

Temporary flooring was laid in the unfloored half of the dairy barn at Kodiak and two box stalls built in for use this winter. The dairy barn and cattle shed were thoroughly disinfected and new windows were added to improve the lighting of the dairy barn.

A 5-horsepower steam boiler and engine and a 50-gallon cream ripener were received, to be used in pasteurizing the milk fed to calves from the tubercular cows. Proper shafting, pulleys, and belting for use in the dairy were also received, but too late to be put in place.

The work of clearing pasture land of small spruce trees was begun this season, about 2 acres being cut ready for piling. As large portions of the pasture land are growing up in spruce seedlings, this land must be cleared and seeded to pasture grasses, small areas in the timbered pasture lands so seeded this spring having shown good results.

General improvement work for the year was greatly delayed on account of the uncertainty of funds until late in August, when the general appropriation bills were passed by Congress. The resulting delay in the purchase of materials and the regular work of putting up feed for live stock has been a great disadvantage to the station all season, as needed supplies could not be obtained nor repairs made until the season's work was nearly over.

Seeding land for hay and silage was a slow and tedious process, owing to the late thawing of the ground, the constant rainy weather, and the soft fields. At Kodiak some 16 acres of hillside land was plowed and seeded after April 27. The condition of the ground was such that it was impossible to plow and prepare more than half an acre of seed bed per day with one team. The hillside plow was used on this land, followed by disking three times and harrowing until the ground was in proper condition for seeding, the amount of work necessary to get the ground into proper condition varying greatly, as some of it worked nicely and was easily put in shape for seeding, while some of the poorly drained spots required many harrowings to break up the lumps and tough sods.

Seeding spring grains was begun May 25 and continued until June 15. On May 25 a variety test of 10 different spring grains was seeded, following this, oats was seeded for hay and silage. By means of a fertilizer drill, a dressing of 240 pounds per acre of nitrate of lime was given all the grain seeded for hay, 100 pounds at the time of seeding and 140 pounds after the grain was up 2 inches or more. One-half acre of cow kale and one-tenth acre of Petrowski turnips were seeded for cow feed. A test of four varieties of potatoes was begun May 28.

At Kalsin Bay 5 acres of bench land was plowed with the deep-cutting gang plow and seeded to oats, a light dressing of manure

being spread before plowing and turned under. Owing to a lack of teams, it was possible to set the plow only deep enough to turn up a little of the old soil underneath the ash. Nitrate of lime was spread by hand over this field at the rate of 200 pounds per acre soon after the oats were up.

CLEARING LAND.

Following the field work an attempt was made to clear some land of stumps and scattering spruce and pine. A hand stump puller was borrowed from the Kodiak Baptist Orphanage, and two men spent nine days pulling stumps from the building site for the cottage and from the barnyard. An average of 18 stumps was pulled each day. After the stumps were pulled and the ground leveled by means of a scraper and drag harrow, the work of excavating and grading about the barn and dairy building was continued. Fifty feet of corduroy road was laid to the barn.

MAKING HAY AND SILAGE.

Owing to the late season, grasses were not mature enough to cut for dry hay by August 1. Beach grass was ready for silage, but was not nearly mature. The crop was light, and, in most places, the stand was very thin, making it necessary to cut over considerable land, using every available beach within reach of Kodiak. Cutting was begun August 1 at English Bay, 8 miles southwest of Kodiak village, where a camp was established. (Pl. X, fig. 1.) A team, mower, rake, and wagon were transferred from Kalsin Bay and a crew of four men set to work cutting beach grass and loading it on large skiffs, which, when full, were towed to Kodiak where the grass was put through the cutter and into the silo. About 8 tons of grass was hauled in each skiffload. A large skiff was borrowed from the Kodiak Fisheries Co., thereby making one skiff available for loading all the time where the grass was being cut. About 30 tons of beach grass was secured at English Bay, and on August 10 the camp was moved to Middle Bay, 11 miles south of Kodiak. From Middle Bay about 50 tons of beach grass was towed to Kodiak, and 7 tons to Kalsin Bay. Camp was moved again August 27 to Kalsin Island, 5 miles from the head of the bay, where 12 tons of beach grass was cut and hauled to Kalsin Bay Station. The portable gas engine and silage cutter (together with team and wagons) was transferred from Kodiak to Kalsin Bay August 30, and the work of putting up silage was continued until September 25, when the silo was full. The use of the skiff for hauling silage was continued along the beaches to Kalsin Bay, as it was necessary to haul all of the beach grass 2 miles or more.

The work of making hay began August 28, at which time two mowers were started at Kalsin Bay and continued from that date until September 30 at such times as the weather would permit.

though frequent showers throughout the month of September made it almost impossible to secure dry hay in any quantity. About one-third of the hay cut was spoiled by rain, and much extra labor was necessary for teddering the curing hay. It was seldom possible to work at the hay more than half a day at a time, but whenever the opportunity came the work was rushed, and the hay loader was used to good advantage (Pl. X, fig. 2.) Hay could be stacked during only five afternoons in the month of September. A few loads were secured at other periods before showers, but at least 25 tons was spoiled in the field after it was cut. Sixty tons of native hay was secured at Kalsin Bay and 3 tons of native hay and 2 tons of grain hay at Kodiak. During the season 165 tons of beach grass silage and 10 tons of oat silage were secured. The greater part of the hay was put up without getting wet, and all of it is of fair quality; and this, with the beach-grass silage, which is of good quality, practically assures the station sufficient winter feed for the herd and flock. As the oat silage was cut during wet weather early in October, at which time the oats were just in the milk stage, considerable volcanic ash adhered to the wet oats, thereby damaging the quality of the silage. The oat hay was cut late in October and was practically cured by dry freezing weather.

The extra work occasioned by the segregation of the tuberculous cattle was considerable. The buildings were thoroughly cleaned and disinfected, the old floor of the cattle shed removed and a new one put in, the mangers and stanchions remodeled, pipe lines and a watering system so arranged as to keep diseased cattle from suspects, suitable lots made for the diseased cattle to run in away from other cattle, and the healthy cattle moved to Kodiak and diseased cattle to Kalsin Bay in October, a time of the year when stormy weather interferes greatly with work on the water. All of this work was carried out during October and early November.

CATTLE.

Breeding beef cattle.—The work carried on with Galloway cattle for the past 10 years by the Alaska experiment stations fully demonstrates that good beef cattle can be produced on native feedstuffs, such as native grasses for hay and silage, with grain hay and root crops to supplement the native grasses. This work was begun at Kenai in 1906 and at Kodiak in 1907. The work at Kenai was abandoned in 1908 and the cattle moved to Kodiak in the early spring, where better pasture and mow lands could be found. There was sufficient pasture grass, but very little mow land of native grasses in the Kenai country, hence it was necessary to clear land and grow grain hay to maintain the herd of cattle. The cost of clearing

land and growing feed for a large herd of cattle was almost prohibitive where there was little market for beef and no means of shipping it to other parts of Alaska from October 15 to May 1.

Brief history of herd.—The breeding herd purchased in the States in 1906–7 consisted originally of 21 cows, 6 yearling heifers, 2 two-year-old bulls, and 1 bull calf. On May 1, 1908, the herd consisted of 21 cows, 6 two-year-old heifers, 1 yearling heifer, 8 heifer calves, 2 four-year-old bulls, 1 two-year-old bull, and 10 bull and steer calves. The herd in 1908 lost 1 cow and 1 two-year-old heifer from impaction, 1 cow from a rupture of the stomach walls by a short crooked wire, and 1 cow from lumpy jaw. The cases of impaction were caused by the cows' eating too much old dead grass in seeking the green grass that came up in the spring. One of the cows killed by this trouble died early in May, the other lingered until the last of June, dysentery having followed the impaction. Again in March and April, 1909, losses occurred in the herd from impaction due to the cattle's eating old dead beach grass from which the deep snow was cleared by the spray from salt water. The cattle ate greedily of this for two days, being affected within 36 hours. Out of 21 head affected 12 died—3 cows, 7 heifers, and 2 yearling steers. Seven cows liberally dosed with salts and oil recovered from the attack.

In 1912, 11 cows and 4 heifer calves were selected, purchased, and added to the herd, making a total of 45 head of cattle purchased, and these, with the 203 calves which have been born to the herd, give a total of 248 head to date. Of this number 82 head have been sold for breeding purposes to settlers of Alaska and to residents of Washington and Oregon, 53 butchered for beef, 18 lost by accident, 5 killed by Kodiak brown bears which are protected by law, 6 lost by suffocation and miring in volcanic ash, 2 lost while moving, 1 stolen in the State of Washington, 1 cow injured on ice, 1 cow killed by rupture of stomach walls, 1 calf drowned, 1 calf lost from effects of castration, and 40 from various causes (12 from impaction of the manyplies, 5 from eating wild parsnip in pasture, 4 from inflammation of the liver probably caused by moldy silage, 3 of lumpy jaw, 1 of tuberculosis, 1 at calving, 1 of pneumonia, 2 calves in pasture of unknown causes, 2 of scours, and 9 of blackleg while at Toppenish, Wash.). Four head, 3 cows and 1 calf, affected with tuberculosis were killed and their carcasses destroyed. The herd (Pl. XI, fig. 1) to-day consists of 27 cows of breeding age, 16 heifers under breeding age (including calves), 2 herd bulls, 3 yearling bulls, and 4 bull calves.

Principal diseases.—The principal cause of loss among cattle in this region is impaction of the manyplies and frequently the rumen. Impaction usually occurs in the early spring. The cattle, hungry

for new grass, in their greed for the tender green shoots that come through the usual heavy layer of dead grass, get too much of the old dead leached stuff, and impaction follows, resulting in most cases in death. The first signs of the trouble are standing aloof from the herd, lack of appetite, harsh, roughened coat of hair, and dullness of the eyes. If the animal is taken at this stage and given liberal doses of castor oil, Epsom salts, or raw linseed oil, the trouble may be overcome. As the case of impaction develops, the animal becomes restless, stepping uneasily about with the front feet, and the dullness of the eyes increases. Later weakness of the front legs is very evident, and the animal stumbles and is unable to stand on the front feet. Slight grunting is observed at this period and grinding of the teeth frequently occurs.

The trouble should be guarded against very strictly, the most effective treatment being such preventive measures as liberal use of common salt, with plenty of fresh, moderately warm water given regularly, and care to see that cattle are never turned out to range where there is old dead beach grass without receiving a ration of either hay or silage every morning.

Practical points in management.—Silage as winter feed for cattle is most important in this country, as it can be put up during any kind of weather and is cheaper to handle in the long run than dry hay. Too much silage should be guarded against, because it seems to overwork the liver, but with about 10 to 15 pounds of hay and 25 to 35 pounds of silage per head daily, cattle can be wintered in good condition.

Allowing cattle to run on winter range will often reduce the cost of maintenance and give fair results with small herds. The practice of burning over the range each year will eliminate the chance of impaction from old, dead grass and allow the new grass to come up earlier in the spring, as the burned-over ground warms up sufficiently for new growth to start two or three weeks earlier than ground covered with a heavy layer of dead grass. The earliest grass of the season comes up on the tide flats where beach grass predominates, and this often affords good pasture early in April. Again in the fall after frost comes the cattle pasture on the wild rye and the sedges growing on the lower tide flats and often affording good pasture until snow covers the ground for the winter. Unless there is plenty of spruce or pine timber for the cattle to run in, they should be provided with winter shelter or at least sheds under which they could be fed, in order to prevent waste of feed during rainy weather. The fact that the cost of hiring laborers for putting up feed on a large scale is prohibitive in many places in Alaska and consequently that the average settler has to do nearly all of the work himself makes economy in feeding imperative.

The long-prevalent idea that cattle should not be housed during the winter months is fast disappearing among stockmen. The cost of the extra feed required to maintain body heat out-of-doors will very quickly counterbalance the cost of good comfortable barns for live stock. Barns large enough to prevent overcrowding and having good ventilation and plenty of light will give best results in this climate. No large outlay for this purpose is necessary, as provision for shelter can be made gradually as increase in live stock requires.

Abnormal conditions.—Losses have occurred in the herd from the volcanic eruption of Katmai and depredations of the brown bear. Those due to the volcanic eruption of Katmai were not preventable, but those due to the brown bear represent an unnecessary hardship imposed upon the settlers by an unjust and unfair law providing protection for an animal that destroys the settlers' herds and flocks and endangers human life. Loss from blackleg occurred while the herd was at Toppenish, Wash., during the fall of 1912 after its removal from Kodiak, a case of blackleg never having occurred on Kodiak or adjacent islands. Wild parsnips or other poisonous plants are to be found in some regions of Alaska, but losses from these are not often encountered in the localities where cattle are now raised.

The main drawback to settlers in out-of-the-way places is lack of transportation facilities. It is up to the settler to find some way of getting his products to market, and in the coast region (represented by the Kodiak Station) power boats of some sort are necessary. The problems confronting the new coast settler are quite different from those experienced by people farther inland where roads are possible. At the Kodiak Station there is no alternative—transportation must be carried on by water. In most localities along the coast which are within reach of the ports of call of the steamship lines, a ready market is found for dairy products and beef, the price usually ranging from 2 to 5 cents per pound higher than on the Seattle market, plus the freight.

SHEEP BREEDING.

Work with sheep is still continued with a small flock. (Pl. XI, fig. 2.) As it was impossible on account of the brown bear to keep the sheep on the mountain-side range at the Kalsin Bay Station, they were moved to a small island near the village of Kodiak for summer pasture. The flock wintered at Kalsin Bay, being kept in pasture until after the lambing season and then transferred to the island. The winter ration was as much hay and silage daily as the sheep would eat. Beginning March 25, the pregnant ewes were given a daily ration, in addition to the hay and silage, of a pound each of a mixture of 2 parts rolled barley, 2 parts cracked corn, and 1 part oil-cake meal.

The flock wintered in fair condition. Of the 14 lambs dropped, 11 were saved. Two old and two young ewes died in the early spring, the two old ewes from eating moldy silage from beneath a manger when moved from the feeding shed, one young one from grain founder, the other from miring in the volcanic ash.

The clip from the flock for the spring of 1916 averaged $7\frac{1}{2}$ pounds per head of wool of fair quality, which still, however, contains considerable ash and is not nearly up to the standard of that obtained prior to the ash fall in 1912.

As usual the lambs made remarkable growth during the season, and the whole flock is in prime condition. The sheep were still on the pasture December 6, at which date the flock consisted of 16 ewes over one year old, 6 ewe lambs, 1 two-year-old ram, 2 ram lambs, 4 yearling wethers, and 2 lamb wethers, making a total of 31 sheep in the flock.

One ram lamb was sold for breeding purposes. There is a considerable demand for breeding ewes by the settlers who are located on or near small islands where there is no danger from bears, but the sheep industry on any considerable scale on Kodiak Island will have to await favorable legislation regarding the brown bear, covering the withdrawal of the brown bear from among protected game animals, the placing of a bounty upon them, and a free and unrestricted sale of the skins from Kodiak Island. This is not an unreasonable request, as the brown bear of Alaska is to be found in great numbers in many sections of the Territory where agricultural development is less promising, and the species will probably never become extinct because of the vast and almost inaccessible regions included in their habitat.

RESTORING PASTURE AND MEADOW ON VOLCANIC ASH.

Natural restoration.—Natural restoration of grasses continues fairly rapid over the ash-covered portions of Kodiak and adjacent islands. The hill and mountain sides have practically been fully restored, and level portions of the land are fast taking on a covering of vegetation, heavy production of seed by native grasses and weeds having hastened the process. Erosion on the hill and mountain sides is fairly rapid, and on the flats and lowlands where the winds and overflow waters from the streams produce their greatest effect, the ever-changing surface is gradually becoming stable as vegetation gains a hold here and there in the ash. The common fireweed (*Epilobium angustifolium*) and scouring rush (*Equisetum pratense* and *E. hyemale*) are the two plants most active in revegetating the ash areas. The fireweed seed find lodgment and grow rapidly in the ash, while its fallen dead stocks catch the drifting, wind-blown

ash, giving lodgment and covering to grass seed and nourishment to the young grass seedlings. Stands of the wild beach grass (*Elymus mollis*) thicken by underground runners and spread fairly rapidly by seed. In the course of a very few years vegetation of the valleys will be fully restored.

Use of tame grasses.—The work of reseeding continues, especially of pasture land cleared of small spruce seedlings, as time and funds allow. The grasses seeded in former years now afford considerable pasture, those not pastured producing a light crop of seed. None of the grass seeded on the ash alone has made heavy enough growth for hay, but that seeded on the hillside land where the ash and soil have been mixed by plowing made a good showing this year and promises to make a fair hay yield another season. Of the seven varieties seeded in 1915, brome grass, redtop, and timothy made the best showing this year, while creeping bent grass, meadow fescue, and Kentucky blue grass produced a good stand but made little growth. Alfalfa winterkilled, but white clover seeded with all the above grasses came through the winter and made good growth this season. Trial grass plats, seeded in 1913 and maintained this year, gave very little promise of success in growing hay grasses on ash without liberal fertilization. All the red clover winterkilled the first winter, very little of the alsike clover survived the three winters, and only a fair amount of the white clover has maintained itself.

Soil improvement.—The work of soil improvement is being carried out as fast as time and means allow. All manures from the barns and sheds have been utilized in growing forage and root crops for the herd and the work of incorporating the ash with the soil beneath has been continued. The use of nitrate of lime for grain hay crops on ash was not beneficial this season, but upon the mixed soil the effect was very noticeable.

Owing to the backward season and the slow growth of all grain crops, no green manuring was done. As the need of saving all field-grown crops was imperative in order to insure plenty of feed for the herd, all grain hay fields were pastured off after the grain hay was removed.

The better soil found on the bench and in the valley lands is covered with cottonwood and alder, such land requiring considerable labor and machinery to clear. Here, the ash deposit has been practically undisturbed since it fell. Leaf mold below and above the ash adds considerable humus, which produces rank vegetation among the trees. It is proposed that soil improvement be limited to the more favorable hillsides where the hillside plow can be efficiently used and to the level wooded lands of the valleys where the deep-cutting gang plow can turn up and mix the black soil with the ash. To carry out this plan a powerful stump puller and two heavy draft teams should

be purchased. The present teams at the station are too light for efficient work with the gang plow.

The work with the gang plow on the bench lands (first, second, and third beaches) has shown that there is not sufficient soil below the ash to insure heavy crop production, there being too much gravel and insufficient silt and clay soil to make a good mixture with the ash. Silt and clay soils encountered back of the old beach lines represent former swamp and marsh lands which subsequent deposits of silt have filled in and built up into considerable areas now grown up with cottonwood timber.

TESTING FORAGE PLANTS.

The testing of forage plants begun in 1914 has been continued with varying degrees of success. Field peas, cow kale, clovers, alfalfa, tame grasses, root crops, and small grains of about 10 different varieties produced at the Fairbanks Station, have been grown on a small scale to determine what crops may be profitably grown in this locality. This work will be continued, though the results of the past season were so unfavorable that there is little to report aside from what has already been said of the grasses and the grain variety tests made this season.

The grain variety test included the following: Finnish Black, Banner, Sixty-Day, and Norwegian Black oats; Romanov and Marquis spring wheat; Chittyna, Success, and Swedish 6-rowed barley; Russian spring rye; and Japanese buckwheat. Small plots of 2 square rods each were seeded on May 28 on hillside land given a light dressing of manure before plowing, the soil consisting of a mixture of volcanic ash and clay loam that had been under cultivation for three years and had produced heavy crops of oat hay every year. The grain, which was very slow in coming up and made very slow growth throughout the season, was cut for hay October 25, when only the three varieties of barley were matured and all the oats were in the milk stage except the Banner oats, which were just in bloom. Wheat made fair hay but did not fill. Buckwheat and spring rye both failed.

The general oat crop seeded for hay was not nearly equal in yield of hay nor in size of head to the Finnish Black and Norwegian Black oat varieties from Alaska-grown seed. The seed for the hay crop was purchased on the market at Seattle, and the variety was unknown.

During this season cow kale was nearly a failure, turnips and rutabagas gave very poor yields, and sugar beets tried for the first time made a poor showing. Field peas, seeded with oats on a well-drained southeast hillside, made a fair growth, but the weather was too cool and wet for a fair trial.



FIG. 1.—PART OF GALLOWAY HERD, KODIAK STATION.



FIG. 2.—STATION FLOCK, KODIAK, AUGUST, 1916.



FIG. 1.—A MATANUSKA HOME.



FIG. 2.—A SUCCESSFUL GARDEN, SHUNGNAK.

GARDEN VEGETABLES.

Garden vegetables made the poorest showing for the past season that has been observed during the last nine years, only lettuce, radishes, carrots, and early varieties of turnips doing well, and cabbage, cauliflower, beets, and peas almost failing. Few cabbage plants formed heads of any size, and peas were just beginning to bear well on October 1.

Potatoes made about one-third of an average crop. A few varieties, however, produced fair crops, and in the more favorable locations where there was a liberal use of kelp or manure normal crops were reported. Of the five varieties grown by the station, Gold Coin from Matanuska seed was easily the best. Burpee's Superior gave fair returns, Extra Early Ohio was worth mentioning, while Irish Cobbler and Clark's Alaska Seedling took last place, the latter being nearly a failure.

SMALL FRUIT.

The tests of varieties of small fruit taken up during the past two years is being continued, with only a few, however, of the best varieties of strawberries, gooseberries, currants, and raspberries which have proved valuable at Sitka. The results for the second year are very promising. While the season was very backward, currants, gooseberries, and strawberries produced fairly well, the strawberries especially giving promise of excellent results. The plants made good growth the first year and produced a goodly number of runners, giving rise to new plants which made good growth before freezing weather came. The whole plat was covered with old hay and silage late in the fall and uncovered April 15. The plants made vigorous growth and began to bloom about July 15. The berries, which set in abundance late in July and began ripening late in August, continuing throughout September and well into October, were large and of fine flavor, but they were not uniformly colored, nor were the keeping qualities so good as could be desired, due to the constant cloudy and rainy weather which prevented normal ripening. During a short dry spell at the beginning of September the berries ripened quickly, and the flavor was exceptionally good.

During the late summer 250 new plants were set out, which made rapid growth and sent out strong healthy runners setting more than a thousand new plants. The work of increasing the strawberry plat will be continued in order to test the advisability of growing berries for market. Further work with all other small fruits of promise will be carried on to determine what varieties are best adapted to this region and to supply as many settlers as possible with plants suited to their needs.

NEEDS OF THE KODIAK STATION.

The most urgent needs of the Kodiak Station are suitable sanitary barns for carrying on experimental feeding tests of beef cattle and for ridding the herd of tuberculosis, and a fully equipped modern dairy building of small dimensions suitable for carrying out experimental dairy work in all details; and, of scarcely less importance, a complete water system of sufficient capacity to supply the dairy and the residence of the station force and to afford ample fire protection for all buildings; suitable fire hose for use at the Kalsin Bay Station; a power stump puller to be used with a team or a 12-horsepower gasoline engine for clearing farm land; two heavy draft teams of mares and a good draft stallion for general farm use and for breeding; a gas engine of 30 or 40 horsepower to be installed in the station power boat *Red Wing* (to insure safety of the lives of those operating this boat); and another large skiff of 15 tons capacity for use in hauling silage, hay, and live stock between the stations at Kodiak and Kalsin Bay.

COOPERATIVE GRAIN TESTING AMONG MATANUSKA VALLEY FARMERS.

By M. D. SNODGRASS, *Assistant in Charge, Kodiak Station.*

Cooperative testing of grains among the settlers was begun for the first time in Alaska during the past season (Pl. XII, fig. 1). The work was limited to the selection of a few of the better-yielding varieties of grains grown at the Rampart and Fairbanks Stations and the distribution of the seed among a half dozen farmers at or near the head of Cook Inlet. Agreements were entered into with these farmers by which they furnished the land necessary for growing the grains and did all the necessary work, while the Alaska stations furnished the seed. Each farmer was also to make detailed reports on the grains so grown, in order that a comparison of yields of the different varieties might be intelligently made.

Owing to the late spring and the scarcity of teams in the Matanuska Valley none of the grains was seeded until after May 25. Six miles east of Anchorage a variety test was seeded May 21 on the homestead of J. D. Whitney, and it was proposed to start another test at the same time on the other side of Knik Arm for comparison with that above Anchorage. Through an error of the postmaster at Knik the seed grain sent to Knik was returned to Kodiak, and as the mistake was not discovered in time to get the seed back to Knik for spring planting it was impossible to make a comparison of grain seeded on opposite sides of the Knik Arm on comparatively thin soil.

The tests in the Matanuska Valley proper were carried on at different localities and upon fairly representative soils, the average soil

having a depth of about 3 feet overlying gravel beds, and including second bench, hillside, and third bench land. Small amounts of seed of several different varieties were distributed among a number of the settlers, to give them a start in producing seed for general sowing. There was great demand for seed grain among all settlers in this region, as only small quantities of seed grain had been produced, some of which gave promise of heavy production, but on the whole settlers had to get their seed from the States without any knowledge as to its adaptability to the country. Much disappointment resulted from the use of such seed, though some settlers were fortunate enough to get seed that did well both for hay and grain.

The results from growing grain and vegetables in the Matanuska Valley during the past two seasons fully demonstrate the advisability of thoroughly testing varieties of grain, vegetables, potatoes, and root crops in general. The wide variation in yield and quality of potatoes grown throughout this region clearly indicates that heavy losses have occurred from growing varieties not suited to the climate and soil.

Below is given a table showing general results of the grain tests made this season. The figures are averages taken from all reports received. Owing to the unfavorable season little of the grain was saved for seed. No accurate yields are reported, as the settlers lacked means of weighing hay and of thrashing the grains. The better varieties were saved for seed by some of the growers, but on the whole the test was very unsatisfactory.

Results of grain tests in Matanuska Valley.

Varieties.	Number of days to come up.	Number of days to mature.	Date of maturity.	Stand.	Height.	Yield.		Adaptability.
						Hay.	Grain.	
Oats:				<i>P. ct.</i>	<i>Inches.</i>			
Finnish Black.....	11	99	Sept. 13	100	54	Heavy	Good...	Well adapted.
Norwegian Black.....	14	96	do.....	100	48	do.....	do.....	Do.
South Dakota Black..	12	96	Sept. 11	100	51	Good...	do.....	Do.
Sixty-Day.....	11	94	Sept. 5	100	38	Fair....	do.....	Fairly well adapted.
Banner.....	15	105	Sept. 18	60	48	Light..	Poor...	Poorly adapted.
Barley:								
Hull-less No. 19851...	11	93	Sept. 4	90	33	do.....	Good...	Well adapted.
Beardless No. 19852..	11	96	Sept. 11	100	48	Good...	do.....	Do.
Swedish 6-rowed No. 19557.	11	85	Sept. 1	90	36	Fair....	do.....	Fairly well adapted.
Chittyna (hooded)...	13	92	Sept. 5	90	48	Good...	do.....	Well adapted.
Champion 6-rowed (hooded)No.118 B3.	12	98	Sept. 10	90	38	Fair....	do.....	Do.
Finland 6-rowed No. 125 B3.	12	96	Sept. 11	95	50	Good...	do.....	Do.
Primus 2-rowed No. 124 B3.	13	96	Sept. 12	95	46	Fair....	do.....	Fairly well adapted.
Success No. 126 B....	14	98	Sept. 10	70	48	Good...	do.....	Well adapted.
Spring wheat:								
Russian.....	10	101	Sept. 16	95	44	Fair....	Poor...	Not adapted.
Romanow.....	11	100	Sept. 15	100	48	do.....	do.....	Poorly adapted.
Chogot No. 133 R....	11	101	Sept. 16	90	36	do.....	do.....	Do.
Marquis.....	12	96	Sept. 13	100	46	do.....	do.....	Do.
Buckwheat: Japanese....	14	(1)	.....	90	24	.....	Failure	Do.

¹ Did not mature.

It will be noticed that the grain was slow in coming up and that the number of days required to mature was taken from the date on which the grain was up. The oats of the black varieties were generally the better. The Sixty-Day variety produced only a fair yield of hay, while the others gave good yields. The Banner oats failed to germinate well, giving a poor stand and light yield of hay and a poor grain crop. All varieties of barley produced good grain crops and fair hay yields, the bearded varieties giving the heavier grain yields, but they are not in favor with the settlers because of the beards. As there are no thrashing machines in the country, much of the barley grown now must be fed as hay. Wheat generally gave poor returns. Wheat hay was fair, but the grain yield was practically a failure. Buckwheat was frosted August 22 and is reported a failure. The Chogot spring wheat was the only variety that matured properly. It is thought that all these varieties of wheat will mature during an average season, but not in such a season as the last, when rains prevailed up to the freezing weather, the entire season being cold and 30 days shorter than normal.

The potato yield of the Matanuska Valley was little more than a half crop this season. The quality was below standard and the percentage of marketable potatoes much lower than in the previous year. Many of the potatoes were planted three weeks later than usual, which, with the cool summer and wet, cloudy weather, produced a crop very disappointing to many of the settlers. All potatoes of good quality found a ready market at very good prices. Garden vegetables, and more especially turnips, rutabagas, and carrots, usually command good prices. The quality is superior to that of those grown in the States.

Small fruits planted last year made a good showing this season, strawberries producing good yields of fruit of exceptionally fine flavor. There is a big demand for plants of all varieties of small fruits adapted to this region.

The cooperative work with the settlers of all agricultural areas of the interior of Alaska and the coast regions offers a favorable field for investigation. A well planned cooperative system should be inaugurated at an early date to help the new settler solve the problem of what to grow, to disseminate facts relating to Alaska agriculture, and to get new and first-hand data on all crops grown throughout the country. The problems needing attention just at this period of the settlement of Alaska are the systematic distribution and testing of different varieties of grains, grasses, and vegetables; the study of marketing conditions confronting the pioneer; and means of helping and encouraging settlers to form organizations which will enable them to work together for the welfare of all concerned.

Definite information is sought by many prospective settlers as to conditions obtaining along the Government railroad, as to where available agricultural lands are to be found, nature and description of the land, available native hay and pasture lands. At present there is little general information available and very little specific information can be obtained. The various departments of the Government have published all they possibly could, but little of that published will give a farmer definite knowledge of the country in which he wants to make a home. To encourage settlers to come and develop a new land, it is necessary to give them the essential facts relative to the possibilities of such a country.

REPORTS FROM SEED AND PLANT DISTRIBUTION.

The following letters are among those received from some of the people to whom seeds and plants have been sent from the Sitka Station. They have been published with a minimum of editing, and they come from those who are in actual contact with pioneer farming and gardening in many sections of the Territory. Some readers state that they get more practical information concerning conditions in various parts of the Territory from these letters than they do from the report of the work at the experiment stations. There are several letters here from the northwestern section of Alaska bordering on Bering Sea, and from other sections far in the interior. These are of special interest because they come from regions where little farming has been done up to the present. These letters also throw side lights on life in Alaska which may prove valuable to those who contemplate settling in the Territory.

Walter H. Johnson, Togiak, Bering Sea.—In answer to yours of July 16 (1915) I wish to say that I received the garden seed, and also Bulletin No. 2 and reports, in which I was very much interested, and I hope that I may receive future reports.

As to the farming possibilities in this locality, I believe I am more optimistic than others who have lived here longer than myself, I having come here two years ago from the Copper River Valley. I find that the first thing to do with this tundra is to remove all the vegetation from the ground, and dig deep to get the sourness out and at the same time put in fertilizer (I have used nothing but salmon heads on my garden), and one can soon have a piece of ground that will produce a good crop of vegetables.

In my garden, half of which had been cultivated one year and the rest spaded up last fall, I have 2,900 square feet. I put in potatoes (outside seed) which I took directly from the cellar the day I planted them, May 11, from which I got 1,500 pounds of excellent potatoes, some weighing 29 ounces each and the first Alaska potatoes that I have ever seen that would crack open when boiled with the skins on. On the rest of the ground we had Danvers Half Long and James' Intermediate carrots, Hollow Crown parsnips, Columbia beets, rutabagas, Early Jersey Wakefield cabbage, Alaska peas, radishes, and lettuce, all of which did fine except the beets, which were almost a complete failure.

We had cabbages weighing 10½ pounds and the heads so solid that a number of them broke open. We had rutabagas weighing 9 pounds and carrots that weighed more than a pound each.

The first killing frost came on September 18 this year, and on September 23 last year. I have done all my planting, both years, between May 10 and May 14.

I have gained some knowledge from Bulletin No. 2, which I feel sure will be of much benefit to me this coming year and for which I thank you very much.

G. A. Danforth, Shageluk, Alaska.—I beg to submit the report of the gardening we did here last summer (1915).

We planted potatoes May 15. The soil was loose and dry. From 3 square rods we dug 700 pounds of fine, mealy potatoes. The tubers were large and for the most part regular.

The carrots were fine, large, tender, regular in shape, and very sweet.

We had poor luck with beets because the seeds did not germinate.

Parsnips did well here.

Lettuce, both the curled and head, were the finest and most tender I have ever seen.

Radishes did exceedingly well. We had radishes and lettuce until frost came.

Early Jersey Wakefield cabbage was the only kind that headed. It made nice, solid, tender heads.

Cauliflower was a complete failure with us, but I believe it can be grown.

Peas (Telephone) attained a good growth, and were tender and sweet. We obtained about 4½ bushels in the pod from three-fourths square rod.

Turnips were nearly a failure with us, on account of old seed. Only a few came up, yet we had some which weighed 8 pounds. Those that did come up were tender and sweet.

Onions were seeded but only a few came up. Some of them grew to be a little more than 2 inches in diameter.

Kohl-rabi did well. We ate most of it when about 2½ inches in diameter. It was sweet and tender and a success.

Rutabagas planted June 21 did much better than the ones planted the middle of May, as the maggots did not attack them. This was also the case with the turnips.

Kale was a complete success, as we kept cutting off the tender sprouts and cooking them. We used it from July 1 until the last of September.

Endive grew well.

Personally, I think our gardening was a success, and we shall try again this summer. I thank you for the seeds sent us for this year.

Arthur H. Miller, Copper Center, Alaska.—In looking over my files to-day, it occurred to me that I had not reported results of the potatoes you mailed to me last spring.

Before planting I cut the seed leaving two to three eyes on each piece, then planted each variety in separate plats, in rows about 3½ feet apart, leaving the hills well apart, so that in case of dry weather there would be plenty of room from which to draw moisture.

I kept them free from weeds with a hoe, with the ground well stirred, keeping the surface as nearly as possible a dust mulch to prevent evaporation of moisture.

During the month of August they began to show need of more moisture, so I carried perhaps half a dozen barrels of water to them during that month, each time carefully drawing away the dust from the hill before applying the water, then hilling up again to prevent the ground from baking.

From those two small packages of seed (I think less than 7 pounds) I dug 235 pounds of as fine, smooth potatoes as I have grown in any soil in the States. They were perfectly free from scab and very true to the original type.

John H. and Edith M. Kilbuck, Akiak, Alaska.—Last year's crop was such a signal success that I wish to report it, even at this late date.

The natives are very enthusiastic over their gardens, and more ground than ever was planted. The year was a good one as no heavy frosts were noticed all through the summer until September 8, when the potato tops were blackened and the following night they were nipped to the ground. The harvesting was done with great difficulty, because of the continuous rainy weather, but by bringing the potatoes into the houses to dry, everything was saved and stored away.

Akiak produced 10 tons of very fine potatoes, the driest and mealiest we ever raised. Carrots could not have been better. Rutabagas were large and free from worms, but the turnips were very badly spoiled by maggots. Cabbage was good and abundant. Beets were large and fine, but some of them went to seed. The radishes also suffered from maggots, but the late crop was fairly good. Celery was large and fine. Lettuce is always of the best, and peas could not be better anywhere. Rhubarb grew very large, and the natives canned some of it for winter's use. Our people now have cellars of their own besides the large school cellar, and every cellar was full. The village has sold to miners and traders, to date, \$664 worth of vegetables, with a possible \$200 worth yet to be disposed of. The people have had all they wanted for their own use, and are planning to put in larger crops than ever this year.

Surrounding villages are asking for garden seeds and tools, and it is only a matter of a few years before all the people in this section of the country will have gardens of their own.

N. Gilroy, Nolan, Alaska.—Your package of garden seed was received in good time, and I thank you very kindly for same. Your seeds have all given good satisfaction. I had not quite one-half acre planted in potatoes, which produced a little over 4 tons of marketable potatoes, besides several sacks of small ones. I got, on an average, 18 cents per pound for my potatoes. This is about 120 miles north of the Arctic Circle.

J. N. McCain, Anchorage, Alaska.—I wish to report that the seeds and berry bushes, which you sent me last April, are doing fine. I have a garden that any one would be proud of. Some of the berry bushes have made a growth of over 12 inches already, and the strawberries are the best thing in the lot.

We have a fine agricultural country here, notwithstanding the late cold spring. I have cauliflower and turnips to eat now (July 20) and will have peas in a few days. I have tomato plants 16 inches high and in bloom. I have nasturtiums, poppies, chrysanthemums, pansies, and sweet peas in bloom, planted out of doors. As to the lettuce and radishes, I am using my second crop on the same ground. I also have potatoes in bloom.

T. E. Phillips, Jack Wade, Alaska.—Your report and seeds arrived at Wade this mail. No doubt all the boys are glad to have the seeds in anticipation of a better and more favorable season next year. Most crops on Wade this year were failures; even the hardy lettuce was backward. Heavy rains for the greater part of the early growing season were the cause. Then in mid-July, a week's frost, with three nights of heavy frost, cut peas and potatoes to the ground. The Petrowski turnips are blighted but seem to thrive, and are forming nice round turnips in spite of the frost.

I lived on the coast a number of years and I feel that the coast blueberry is a "winner." It is a big asset to Alaska and is not taken at its full worth. It should be advertised and placed among the fruits of the States.

T. A. Anderson, Government teacher, Quinhagak, Alaska.—I have this morning received some Petrowski turnip seed from your station, and beg you to accept my thanks for same. I arrived here last December and have this sum-

mer two good gardens—one a school garden and the other my own. Many of the seeds were, unfortunately, too old and did not grow. These were seeds that I found here on my arrival.

I planted 4 pounds of potatoes April 1 in boxes in the house and transplanted them into the garden the 1st of June and they are now (Aug. 4) in large buds ready to bloom. I got 120 plants and you can be sure I am very proud of them. We have potatoes, radishes, lettuce, carrots, onions, parsnips, beets, turnips, kohlrabi, red and white cabbage, and rhubarb, and for the first year that the ground has been used everything is fine. I expect to spade up a larger piece of ground this summer and fertilize it well, so next year I hope to be able to tell you more about what can be done in this part of the country in the line of gardening.

The natives' food consists of dried or frozen fish, a little salt meat, tea, and in the fall a few berries that I understand grow on the tundra. Just think what it would mean to the health of the people here if they could learn to grow some vegetables and fruits. I have taken over 800 radishes and more than 2 bushels of lettuce out of the garden at this time and have given them to the natives. I will appreciate it if you will send me a good supply of vegetable seed for next year and would also be very grateful for a few flower seed, but there is no need to send anything too tender, as the wind here is very fierce. I would like to have a few seeds of some plants I could have in the house, as I like flowers and it would be a pleasure for me in this lonely place.

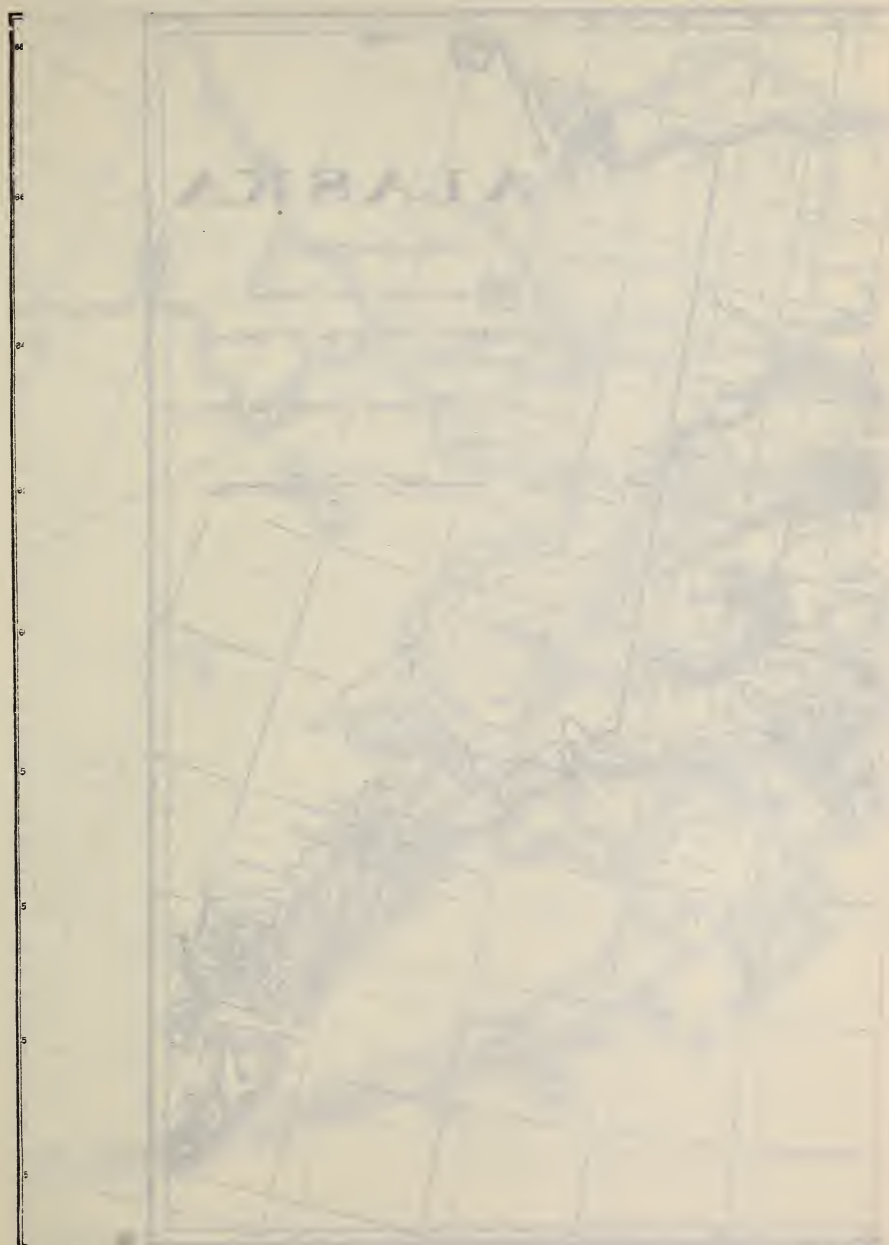
George Nissen, Fairbanks, Alaska.—Last season, 1915, we had the largest crops we have ever had in and around Fairbanks.

The first summer, 1914, all of the 11 apple trees that you sent me were growing, and 3 currant and 3 gooseberry bushes out of 6. Fifteen raspberry bushes were growing out of the 25, and 2 of the 4 roses grew. The 4 basket willows were growing the first summer, and I expected they would do well, but they did not winter. None of them grew the next summer. None of the strawberry plants grew. The land here is a sandy loam, and I think you will agree with me that a clay side hill sloping to the southward is better adapted to raising strawberries than a sandy loam.

Fred Levey, Ophir, Alaska.—I thank you for the seeds I have received from your station. I have experimented with ground on Yankee Creek for four years, but with no success. I can grow lettuce and radishes, but that is about all. The very heavy frosts that we have here kill all plants unless protected by a covering. The thermometer registered 2° of frost on July 20 and 3° on July 29. I believe we are too high up. Tokotna seems to be an ideal place for farming. Everybody there grows all farm produce for his own use and some for sale. I am figuring on putting up a hothouse to grow vegetables for table use—just a small one 40 feet long and 18 feet wide—and will let you know what success I have. The soil here needs plenty of fertilizer as it is very sour.

Fred M. Sickler, United States Government teacher, Shungnak, Alaska.—I have received a shipment of plants from you and also the potatoes and plants from Supt. Gasser. The strawberry plants from both stations were dry and dead. The potatoes arrived in fine shape, but rather late for planting. We put some in a cold cellar and planted some, which at the present time have shoots several inches above the ground. About half of the berry plants were dead. Of the plants that you sent last year, I have only the horse-radish. The berry bushes made a good start last fall, but I was afraid that the severe winter would kill the young shoots, so I put the bushes in a cellar. This was unfortunate as they were destroyed by mildew.

The Early Six Weeks potatoes we received from you last year were carefully nursed indoors and produced potatoes that we were able to use for seed this







MAP SHOWING AGRICULTURAL REGIONS IN ALASKA



year. Some of the tubers produced seed potatoes without even sending up leaves and shoots. This variety resembles the stock we have on hand, but I believe is not so early as ours. I intend to send you some this fall for trial and identification.

I have a very fine garden this year (Pl. XII, fig. 2), and the natives in this village take a remarkable interest in gardening. The red-top turnips are ready for use and the Early Express cabbage is also mature (Aug. 10). I have had fine success in raising garden peas this year. Horsford Market Garden peas, started in paper boxes indoors, are loaded with full pods. Telephone, Strata-gem, and Prince of Wales, sprouted indoors but planted in the open, are loaded with blossoms and pods that will be ripe (for cooking) before frost. I was also able to grow Mohawk beans for the first time. I started them in paper boxes and put them out in the garden. Some of the pods are over 5 inches in length. Mr. Lloyd and I have tried to grow tomatoes, but without success as yet. We get large vines and many blossoms, but no fruit sets. We have tried Swiss chard for the first time and we shall grow it again, as it is fine for greens.

I notice that you have trouble in growing beets at your various stations. I have tried all sorts of soil, but the beets send up flower stalks before the roots form. I find that by cutting off the flower stem the beets will produce large roots, but this is quite a bother. Spinach (Norfolk and Victoria) also wants to go up to seed.

Everyone is going to have plenty of potatoes, cabbage, and turnips. I have had good success in growing native raspberry bushes in the garden. They set considerable fruit this year. I have also found a native leek or wild onion that does very well under cultivation and can be used to advantage here, where imported onions are scarce.

Fred M. Sickler, Shungnak, Alaska.—We are, as you know, north of the Arctic Circle and west of the Yukon River.

We have had a very successful summer (Sept. 22, 1916). Our cabbages weighed 8 pounds, some of our potatoes 2 pounds, and some of our turnips over 6 pounds. We raised lettuce, chard, beans, peas, rhubarb, cauliflower, radishes, beets, and other vegetables that were very fine.

Over a ton of vegetables has been sent from Shungnak to Kiana and Kotzebue, the greater part being from the gardens of the natives. The price paid was 4 cents a pound. Several mine operators use Shungnak potatoes as an important part of the food furnished their laborers. Some of the natives refused 5 cents a pound for their potatoes.

L. Lloyd, Shungnak, Alaska.—I wish to say that the vegetable gardens of this place all did well last season. My garden did more than I expected. I got 600 pounds, or 6 sacks, of potatoes and 8 sacks of turnips. Some of my potatoes were well advanced in ripeness, having a large percentage of mealy tubers, and I could not wish for better turnips. My turnips are all Petrowski. They are by far the best turnip for this part of the country, and they are splendid keepers. I have kept them 15 months after taking them out of the garden. I have raised my own turnip seed for 10 years, and I notice now that my seeds and turnips are two weeks, or even more, ahead of the earliest turnip that comes in here. My turnip seed was ripe and thrashed and put away this season by July 25. Next year I shall use a top-dressing of nitrate of soda, and then I shall let you know the results.

E. E. Van Ness, United States Government teacher, Unalakleet, Alaska.—Inasmuch as the Government has been so faithful in sending us garden seed I feel it my duty, as well as a pleasant privilege, to compensate somewhat by reporting the successes and failures we have met at Unalakleet in gardening.

Our soil is not naturally good, but by putting upon it many loads of rich dirt taken from old igloo sites it is quite productive, but, of course, has to be enriched from time to time.

Our village is situated on a spit thrown up by the waves composed largely of soil washed down by the river. In it are much bark and great quantities of gravel and sand. Due to the composition I fear the soil would deteriorate considerably in productiveness by seepage. My garden is small and slopes slightly to the south. We have a small hothouse, some 8 by 10 feet and sufficiently high to permit working under the glass. About half of the wall is in the ground. It is heated at night and during cold days by a coal-oil stove.

Last spring I cut my potatoes to one eye on a piece and placed them close together in shallow boxes, covering them with about 1 inch of soil. There was about 3 inches of soil beneath them. These were planted April 10, which, due to the lateness of the spring, was about three weeks too early, for before the weather would permit transplanting to the open ground the plants had attained a height of about 6 or 8 inches. The roots were, of course, matted together. I despaired of favorable results, fearing the plants were too large, but by pouring plenty of water in the boxes I was able to take them up and separate them without bruising them or tearing off the roots to any very great extent. A few potatoes had already formed and some were the size of marbles. A goodly number were torn off in taking them from the boxes. I put two plants to the hill in rows some 3 feet apart and about 2½ feet apart in the row.

The spring before I had put 80 coal buckets of fish heads, etc., in my garden, which is about 50 feet square. These I buried in holes here and there all over the garden. About the last week in July I dug into a few hills to see what the prospects were, for I daringly trusted to my little garden for my year's supply of potatoes, and accordingly did not order any from the outside. I permitted the potatoes to stay in the ground last fall until there was some danger of freezing. Barely 180 hills produced 600 pounds of large potatoes. There was not a half bushel of small ones in the whole lot. I never saw such large, well-formed potatoes in my life. The largest well-formed one weighed 1 pound 15 ounces. Some were larger, but not so regularly formed. I do not know the name of the potatoes, but inasmuch as they were sent from the Sitka Station I call them the "Sitka." You sent them three years ago last May. They are splendid potatoes as to eating and keeping qualities. I have been saving my own seed from season to season. As yet not a sign of a sprout has appeared on them (Jan. 25). Outside potatoes have already begun sprouting. The eyes are shallow and the potatoes are delicious cooked in any way.

This year I discovered that quite a number of the potatoes, especially the large ones, were covered with rust spots similar to the disease encountered outside. The spots were about one-half inch in diameter or smaller. There was an abrasion, or rather a cracking, of the skin, which was dark brown, with the edges curled up or rough looking. These spots did not affect the potato to any depth, perhaps one-eighth inch. Did the fish put into the ground cause the disease? Last year I think there were no signs of the disease. Can you tell me what to do to fight this trouble? Is the trouble in the soil? If I plant absolutely clean potatoes, will the coming crop be affected in the same way? I hope that you can tell me what to do.

I planted both cabbage and cauliflower in the hothouse in boxes on April 9, but they were a little too early for the spring. The largest of each variety weighed 8 pounds each. All the heads were splendid. Every plant formed heads. It seems that the flavor of both is far superior to that of the cabbage and cauliflower grown in the States.

Celery was started in the hothouse about the middle of April, and when large enough the plants were carefully transplanted to the open ground. At first it grew very slowly, but later grew rapidly and formed fine stalks, some of which were fully 10 inches in length and the most delicious that I ever ate. If I remember correctly, the variety is the "self-blanching" White Plume. I have never raised celery before. Should the earth be drawn to it when the plants are quite young, and should this be continued until the stalks are full grown? I have already received one package or sack of seed from your station, but I notice that no celery seed is included. Could you send a small package in an ordinary envelope? It would be sufficient for the whole village.

Turnips were planted in the open. They grew rapidly and produced large roots, but for eating they are far inferior to the rutabaga, and therefore I do not think I shall plant more than a part of a row next spring.

Rutabagas were planted in the open. They grew well, and some of the roots weighed 5 pounds. They were very sweet and juicy. They are delicious when raw and more so when cooked. I am planning on planting a large patch next spring. They keep well and are in splendid condition now, and look as though they would keep for several months yet.

We planted the Red Wethersfield in the open. They were delicious, but not large. The largest was about 2 inches in diameter.

Carrots, planted in the open, produced well-formed and large roots. The largest was about 2 inches in diameter and some 7 inches in length.

Hollow Crown parsnips were planted in the open as soon as the ground was warm enough. Cooking qualities were very good. Some of them, instead of producing a single root, divided into four or more small roots.

Barley was planted on the tundra in a new garden spot, which was unfenced. A herd of reindeer trampled it all out, with the exception of a few straggling stalks, and these produced well-formed heads with grain. I hope to give it a better trial next spring.

I had three roots of rhubarb sent in from the States. They came late in the fall. I put them in a box of gravel and then forgot and left them in an outside shed, where at times during the winter they were frozen as hard as stone. In the spring I took the box into the hothouse, and every few days I poured water into it. In the course of three weeks or so I was agreeably surprised to find that all the roots were sending up shoots, and as soon as the weather permitted I transplanted them to the open, where they grew rapidly. Some of the stalks were 16 inches long. Some rhubarb seed was also sent me, and I planted it in the open last spring. The plants did well, having fairly good-sized leaves and stalks the size of a lead pencil. I took up some of the young roots and put them in the cellar, for I feared the extreme cold would be too much for them. There is about 5 feet of snow on the rhubarb in the garden. I think it will revive again in the spring.

Lettuce and radishes grow to perfection. It is no trouble to grow great quantities of both.

Peas seem to grow so much to vines that even the dwarf variety topple over and pull down the supports, and shade themselves so much that the cold weather gets them too early for the crop to produce satisfactorily.

Charles A. Sulzer, Sulzer, Alaska.—I take pleasure in reporting to you that the season of 1915 was a very advantageous one for gardening in this section.

The season was unusually dry, but nevertheless rain came at the right times to prevent undue harm from drought. The berries did exceptionally well, probably better than could be expected during the average year.

The vegetables all gave satisfactory results, and it was found that, as in previous years, turnips, carrots, beets, parsnips, radishes, lettuce, celery, rhubarb, and Swiss chard can be entirely depended upon under all conditions.

Cabbage, cauliflower, and peas gave only fair results, owing to the dry weather, which seemed to develop worms, with ill results to the young plants. The potatoes were nearly a failure. They had splendid vines, but few large potatoes, which I am satisfied was due to poor seed.

The record of the garden here has been kept as accurately as possible, and it is submitted with the hope that it may prove of some value in the encouragement of agriculture in Alaska. After a number of years of experience here I am fully convinced that market gardening will well reward anyone who selects the right location and cultivates with proper diligence.

The time of harvest is given, as is also the date we began using the different vegetables. The parsnip yield is estimated, as nearly half of the crop is still in the ground. They are very delicious.

The garden was given considerable care, and the prices used are for choice articles, possibly somewhat higher than could be obtained on a large scale. To offset this fact it must be remembered that the pro rata expense of a larger undertaking would be much smaller.

Data re garden of Charles A. Sulzer, Sulzer, Alaska, 1915.

Variety.	Area.	Date of seed- ing.	Date trans- planted.	Date of harvest.	Yield.	Returns.	Remarks.
	<i>Sq. ft.</i>						
Strawberries, 390 plants	2,500	.....	1914.....	June 21	378 boxes....	\$83.16	Excellent.
Raspberries, 90 plants	680	.....	1911.....	July 19	280 boxes....	42.00	Do.
Petrowski turnips.....	1,644	May 1 and 9.	.....	July 25	2,680 pounds	80.40	Do.
Cauliflower.....	564	Mar. 25.....	June 3 (120 plants).	.....	98 heads.....	9.80	Fair.
Peas.....	850	Apr. 27 and May 30.	.....	Aug. 12	308 pounds..	15.40	Do.
Parsnips.....	575	Apr. 29.....	.....	Sept. 10	1,200 pounds	36.00	Excellent.
Cabbage.....	1,120	Mar. 25.....	May 27 (80 plants).	Sept. 12	472 pounds..	23.60	Fair.
Radishes.....	224	Apr. 15.....	.....	June 17	177 bunches..	8.85	Excellent.
Beets.....	480	Apr. 30.....	.....	Aug. 25	765 pounds..	22.95	Do.
Celery.....	315	Mar. 27.....	July 7 (170 plants).	Sept. 30	162 bunches..	16.20	Do.
Rhubarb.....	106	.....	1909.....	Mar. 21	192 pounds..	9.60	Do.
Lettuce.....	594	Mar. 20.....	May 25 (340 plants).	July 10	325 heads.....	22.75	Do.
Carrots.....	560	May 5.....	.....	Sept. 1	1,360 pounds	40.80	Do.
Kohl-rabi.....	75	Apr. 20.....	.....	.....	47 pounds....	1.40	Fair.
Finland turnips.....	430	Apr. 15.....	.....	June 21	532 pounds..	15.96	Excellent.
Swiss chard.....	21	May 3.....	.....	July 25	78 pounds....	2.34	Do.
Potatoes.....	116	June 10.....	.....	Oct. 1	197 pounds..	3.94	Poor.
Green onions.....	38	May 5.....	.....	Sept. 10	19 bunches..	.95	Excellent.
Total gross value.....						436.10	
Expense, 396 hours la- bor, at 44 cents.....						174.24	
Profit.....						261.86	

Steve Ragan, Haines, Alaska.—I desire to give you a brief report of my garden work and observations during the year 1916. As I wrote you in April, I started a good many plants in small cans in the house. These were the baby milk cans with the top taken off by melting the solder on top of the stove. They serve nicely, and the dirt and plant roots come out nicely by wetting the soil thoroughly. I started Brussels sprouts, cabbage, and cauliflower, as well as tomatoes this way. I had two tomatoes get ripe, though this was a very poor year for them—the spring seemed unable to get settled—and was so unlike the great year of 1915. One of the ripe tomatoes seemed perfect, and I saved

the seed from it. I am going to keep at it until I find a tomato that will grow in southeastern Alaska, if that stunt is possible.

The cabbage grew slowly and did not head well. The heads were not solid, as is the general case. The best I had was from seed which had been imported from Sweden by a man in this community, the seed having been sent to him by his father. I shall put some of them to make seed this year. I still have lots of cabbage in my cellar which kept reasonably well. I have not trimmed it since placing it there, but expect to trim it this week. The Brussels sprouts did well. I gathered none in the fall, but am digging them out of the snow this winter. These were the seed you sent me. Cauliflower did nicely, most of it heading. Early Snowball did best.

The Irish Cobbler, Early Anway, and Burpee's Superior potatoes were grown, the last being the best. I had almost lost the seed of these, but managed to pick a few out of some that had been frozen. I will have a nice patch of them this year. All varieties produced well, the Burpee's Superior making about 500 bushels to the acre.

Dwarf Curled Scotch kale did well, as did both purple and white kohlrabi. Golden Necklace rutabaga was the best of that vegetable I grew. It was large, firm, smooth, and a good keeper. I grew the various kinds of radishes from early to late, having plenty to eat from the open ground in May. Northwestern Premier peas were the best I grew, they bearing early and continuing to bear to frost. Nine peas to a pod were not uncommon. Quite Content and Alderman also did well. I had lots of string beans, and if it had been a good year could have supplied the community. My two boys, one 8 and the other 6, are my partners on the farm, and they expected to sell a lot of beans, as they did of the peas. Valentine, Early Refugee, and Golden Wax were the principal crop. Davis White Wax is my favorite for this locality, but I was unable to get many seed this year. I grew enough beets to supply myself and some for the boys to sell. Early Petrograd made the best showing; however, none did extra well, as the year was bad all through. Danvers Half Long and James's Intermediate were the best carrots. We grew several other varieties. Offenham Market parsnips give the best satisfaction of any, though we also grew Hollow Crown. The latter had most rootlets and was harder to harvest.

No onions grew to more than $1\frac{1}{2}$ inches in diameter. I had the Yellow Danvers and Prizetaker. The year was poor for them. My rhubarb continues to be a source of pleasure and profit. I have the Mammoth Victoria.

Parsley did well. Spinach went to seed prematurely, but Swiss chard did well. I canned 24 quarts of greens for winter in Mason jars. Also, I made pickles of cauliflower, kohlrabi, string beans, onions, nasturtium seed, and green tomatoes mixed. Also, I included carrots in most of them and pickled some carrots by themselves. I also pickled beets, and made chowchow of beets, cabbage, horse-radish, brown sugar, and vinegar. I canned rhubarb, blueberries, strawberries, raspberries, cranberries, salmon, and I bought one crate of peaches and canned them. In all I canned 136 quarts of fruit, vegetables, and fish this winter. I canned peas and string beans without losing a single jar. In fact, I only lost two jars of the whole pack and refilled them immediately as they were discovered, before it was too late to refill them. I canned blueberries in jars and bottles by filling them to overflowing, and then with water to overflowing (cold water), and corking them. I had heard this could be done with them, but had never tried it before. I had the best of success. Some canned rhubarb the same way. I used a wash boiler to cook the things I canned, with the cold-pack system.

I think all the basket willows are growing. I asked for one or two and received 75, and therefore gave some to my neighbor de Blondeau, some to my

neighbor McGuire, and some to Mrs. Charles McRae. The rose bushes all lived during the summer, but of course did not bloom.

Apples were grown on three or four different places last year. I have no fruit of bearing age. As I reported before, the apple trees you sent me were all killed by mice. One has sprouted up again and is growing nicely, but I do not know whether it is above or below the graft. It had been set deeply and was afterwards broken off. I will dig down under the ground and see if I can find the graft. If I can get another start of these trees I will see that they are properly protected. I did not know the mice would work under the snow and ruin them.

Mrs. M. L. Natt, Kenai, Alaska.—The apple trees grew 8 inches. The berry bushes had all their leaves when I received them, and they were bleached white. When I set them out they died off, but some new leaves came out on some of the stems. I lost two gooseberry bushes. The honeysuckle was dead when it came. I received these the last of May.

I did not have much luck with my garden this summer. My beets and white turnips went to seed when they were about the size of a dime, but the Petrowski turnips were fine and grew like weeds, the best I have ever had. I also had some fine cauliflower, which headed up well. I got the seed from the Lilly Seed Co., and also some fine celery seed. If we have any nice weather this coming summer I expect to have a fine garden and will take a picture of some of the things I raise and send it to you.

Mrs. H. Pingel, Nolan, Alaska.—The potatoes you sent came on the first boat. We had a patch of ground all ready and put them in before night the day they came, but it was too late in the season. They could get only fairly well started before the frost came. I divided them up between Mr. Gus Benson, Ernest Collins, and Mr. Jack Hood in town; also Mr. Wilson in town, who tried to keep his for this year. Potatoes have done well up here. We have been eating our own potatoes until now (Jan. 31, 1917), and still have some. They were medium size. Mr. James Minano, of Coldfoot, has a good report of potatoes sold last year—60 crates, at \$15 a crate. He is a Japanese and his wife a Koboth girl. Neither can read or write, so I could not get more information regarding the size of the potato patch.

April is the last mail by dog team. If we could get potatoes in then, we could give them a fair chance. If you send them in we will try. The Government seeds get a good trial up here, as everybody has a garden. Flowers have done very well. We had the grandest display of pansies, sweet alyssum, sweet peas, marigold, etc. I tried all the different kinds which were sent and all the vegetable seeds, and my report is as follows: Petrowski turnips and white turnips did very well. The white turnips got to a good size. Onions, carrots, cabbage, and cauliflower were small. Brussels sprouts do not mature at all. Kale was fine and kohlrabi also. In fact, we had a good garden all summer, with the finest radishes, lettuce, etc.

Mr. Ben Peterson has given these figures for his potatoes at Nolan: One-fourth acre, 3,200 pounds, without fertilizer, or 500 bushels to the acre.

A. Steicker, Quinhagak, Alaska.—Unfortunately I can not report much success with my garden for the last summer. We have had, I think, the most unfavorable season so far experienced. The spring was cold and wet, and we were at least two weeks behind in planting. The latter part of June and part of July was warm, but there was very little sunshine. The rest of the summer was exceedingly wet all the time up to the freeze at the end of October. We made a visit to Bethel and Akiak the latter part of August, and saw that they also were far behind.

We had our garden here enlarged, and also tried two other places near the river on sandy ground. In our garden here we put manure from the dog teams

in the ground where the potatoes were planted. This proved to be excellent, but owing to the late spring and lack of heat and sunshine the potatoes were small. Altogether we got a little over one crate. If we had had a good summer we would certainly have had five crates of good potatoes, for there were a great many, although small. Our cabbages and cauliflower all were spoiled by worms. Strange to say, turnips grew neither here nor near the river.

I gathered a ton or more of offal from the fish splitting and let it rot, which no doubt will do well for next year. We had very good flowers.

Mrs. S. E. Achieon, Skagway, Alaska.—I want to tell you of my two apple trees which were sent to my husband from your place about 10 years ago. For several years they did not seem to grow and there would be a few blossoms, but no fruit, till two years ago, when five apples matured on one tree, a Siberian crab, I think, although it was supposed to be a yellow apple of some sort, from the name which was on the tree when it came. The apples are about the size of crab apples in market and the same color. A year ago it matured 75 apples and this year it had 650, when I picked them. The other tree, the larger of the two, had two 10-pound lard pails of small yellow crab apples, similar to the little wild crab apples in the East. They make delicious preserves. These trees are not sheltered or protected in any way, but are out in the open.

Now, I have a lot, which is surrounded by trees so as to leave a sheltered place in the center, and I would like to plant some trees there this spring. The past spring you sent my brother some apple trees in bloom, and two or three apples matured on them. Will you send me about a dozen trees of bearing size, like the ones you sent him—the real apple, not crab—and a cherry tree, if you have them, and I shall pay the express and any other charges there may be.

The berry bushes and plants, also the roses and honeysuckle have all done splendidly the past year and the strawberries bore well.

D. E. Stubbs, United States commissioner, Aniak, Alaska.—From my limited observations along the coast and along the Yukon and from such reports as I have been able to obtain, the central Kuskokwim Valley is miles ahead of any other section from an agricultural standpoint. With our mild climate, long summers, rich soil, and plentiful rainfall during the summer, the products of the garden are unbelievable, and this, together with a beautiful river, good timber, and plenty of game and fish makes an ideal region for homesteading.

A year ago I was tempted to send in a report with samples and photographs, but a bare statement of the facts would have classed me as a fakir, so I let it go.

With a motor boat I made a trip of about 300 miles up the river this summer, and was surprised to find a nice neat garden at nearly every Indian cabin—all fenced in and growing luxuriantly. Last summer natives showed me turnips of their own raising, probably half of which would weigh 10 pounds. In one instance a turnip weighed 18 pounds. These people are inexperienced in gardening and use no artificial fertilizers of any kind.

In my own patch I had probably a crate of potatoes every one of which would weigh over 3 pounds and some over 3½ pounds, with clear, smooth skin, shallow eyes, sound, dry, and mealy flesh. The entire yield was large and good sized, while the vines grew to a height of 6 and 6½ feet.

Adam Werner, Matanuska, Alaska.—I wish to report on my success with this year's crops and to thank you for the seeds you sent me last spring. All of them did well except the spinach, which went to seed too early. Petrowski turnips were fine and only a small percentage was wormy as compared with the white or purple-top varieties.

I also wish to thank you for the fruit trees you sent me. They were in very bad shape when I received them the last week in May, but I had a place reserved for them and watered them well for the first few weeks and they all came to

life again, except one which made a little start and then died. The others made a growth of 6 to 9 inches. I have the little fruit trees all wrapped up for the winter to protect them from cold, mice, and rabbits, and to prevent their coming to life too early in the spring.

The gooseberries and raspberries made but little growth this season, but I think they will live and do better next year.

Mr. M. D. Snodgrass, of the Kodiak Experiment Station, was kind enough to give me some seeds of several kinds of grain. I put in 14 different kinds of barley, oats, and spring wheat, but all of it failed to ripen. We had a great deal of rain and practically no sun during the latter part of the summer and through the fall. The oats grew very rank and would have made first-class silage.

I have raised my own turnips and rutabaga seeds for next season, and will try to raise most of the other garden seed for my own use for the season of 1918. I made a flower bed around the house and the flowers were beginning to bloom nicely when the first frost came and killed most of them.

I would appreciate another parcel of seeds, also more fruit trees and shrubberies if you can spare them. If you have any kind of literature on horticulture I would be glad to have a copy. Please send me the report of the Alaska Experiment Stations for 1915 when it is ready for distribution.

C. Campbell, Farragut Bay, Alaska.—Owing to the cold, backward spring nothing grew to amount to anything until the middle of August. The potatoes, except for a small portion, rotted in the ground. The rutabagas on the river flats were completely destroyed by angleworms, but the rest of the crop, including the rutabagas in the beach garden, was not harmed and the latter were as good as any I ever saw. The carrots and beets did very well.

C. W. Wagner, Camp 18, Matanuska, via Anchorage, Alaska.—I am sending you herewith some pictures of my ranch on Eska Creek, Matanuska Valley, showing you my garden, cabin, and pigs. Although we had a very poor season, I raised about 1 ton of potatoes and enough vegetables for myself and family. I wish you would send me some samples of grain, alfalfa, and grass seeds for trial, also some Petrowski turnip and other vegetable seeds.

C. Jay Mills, Kake, Alaska.—Bottom onion sets were planted April 23 and did extra well, although there were several nights with frost after they started growing. On April 30 I planted Tall Telephone, Prince of Wales, and Admiral peas, the first two varieties being inoculated, as were also the Spencer Sweet peas. The Tall Telephone and Prince of Wales peas attained a height of 10 feet and were loaded with peas all summer. The Admiral peas were 4 feet high and very sweet. We think inoculation increased the growth and production at least one-fourth. The sweet peas flowered freely all summer.

Early Prize Head lettuce grew well. We cut it all summer and the more it was cut the more tender it became. French Breakfast radishes were planted, but the maggots and worms bothered them. Two varieties of cabbage were planted, Copenhagen Market and Early Jersey Wakefield, both of which did fairly well. Petrowski turnips did excellently and were almost free from root maggots. Two varieties of carrots, Danvers Half Long and James's Intermediate, both grew well, but we failed to thin them soon enough to gain the best results.

On May 1 a few of the johnny-jump-ups were in bloom, while on May 15 the first of the rhubarb was used, and on May 22 Gold Coin potatoes were planted. They produced an excellent crop.

On June 1 Sweet White Russian rutabagas were planted, but a little too late, and even then the root maggots destroyed most of them. The few that reached a marketable size were very sweet and juicy. Gold Dollar strawberries ripened

almost two weeks earlier than the other varieties. Then came the Sitka Hybrid, No. 230, with a better flavor, though not as heavy a yield. Then came No. 251 with 94 berries—a small crop. Magoons were the heaviest bearers, but the last to ripen.

Two-year-old St. Regis raspberries bore two small crops, the first crop being the best. Three-year-old cherry currant bushes produced extra large smooth fruit but were not very heavily loaded and 3-year-old Champion gooseberry bushes did fine.

German iris were planted in the spring and flowered during the summer. The pansies grew from seed which ripened in 1915 and fell into the flower bed. They blossomed all summer and until killed by the freeze of February 1 of this year. They had been covered with snow previous to the freeze, but about the last of January the snow melted and the cold weather killed the last blossoms and plants. Nasturtiums grew over the front of the cabin and were pretty all summer and fall.

CLIMATOLOGICAL DATA.

NORMAL TEMPERATURES AND PRECIPITATION IN ALASKA.

The following data from 38 stations have been compiled by Mr. M. B. Summers, chief of the local Weather Bureau office, at Juneau, from reports sent to the Alaska experiment stations during the past 19 years:

Normal temperature and precipitation.

Station.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	An- nual.
Allakakat:													
Temperature .°F..	-27.4	-9.4	-2.6	14.6	41.7	55.4	58.1	50.4	38.0	16.2	-10.3	-17.9	17.2
Precipitation .in..	0.64	0.72	0.77	0.47	0.88	0.91	1.61	1.71	1.15	0.93	0.59	1.02	10.4
Atka:													
Temperature .°F..	33.5	33.2	33.0	36.4	40.7	45.8	49.7	51.3	46.6	42.0	36.6	32.0	40.1
Precipitation .in..	7.65	5.36	4.86	5.78	6.20	4.32	5.46	6.08	7.84	9.79	10.5	6.73	80.6
Calder:													
Temperature .°F..	27.8	32.3	35.9	38.6	45.3	48.8	52.2	51.9	48.4	41.6	34.2	32.5	40.8
Precipitation .in..	8.86	7.52	9.06	9.41	5.10	3.88	6.04	7.02	13.0	16.7	13.9	13.3	113.8
Candle:													
Temperature .°F..	-7.2	-4.6	-4.7	10.6	35.3	48.3	53.7	50.3	39.0	23.7	6.0	-1.8	20.7
Precipitation .in..	.....	.....	.....	.....	0.57	0.74	1.31	1.44	1.60	.....	.....	.....	.....
Circle City: ²													
Temperature .°F..	-11.8	-17.7	0.6	20.6	42.0	57.4	61.3	54.7	38.0	14.6	-10.3	-12.7	19.7
Precipitation .in..	0.83	0.32	0.61	0.84	0.68	0.88	1.89	1.85	1.86	0.78	0.42	0.72	.....
Coal Harbor:													
Temperature .°F..	28.0	29.0	30.1	32.7	40.8	47.6	52.5	52.9	49.0	41.7	35.4	30.2	39.1
Precipitation .in..	3.72	4.51	3.68	5.56	3.23	2.44	3.10	3.78	4.44	4.71	5.25	4.08	48.5
Copper Center:													
Temperature .°F..	-11.4	2.5	13.6	29.1	45.0	54.2	56.1	53.2	43.1	28.9	5.4	-3.3	26.4
Precipitation .in..	0.63	0.49	0.24	0.08	0.43	0.86	1.56	1.10	1.22	0.96	0.76	0.54	9.07
Cordova:													
Temperature .°F..	29.0	33.0	34.0	37.6	44.9	50.6	54.8	54.3	49.7	42.1	33.6	31.0	41.2
Precipitation .in..	5.84	9.75	10.7	7.90	8.62	7.80	6.90	12.1	22.4	16.9	8.16	15.9	133.0
Dawson, Yukon Ter- ritory:													
Temperature .°F..	-21.3	-14.1	3.9	30.5	47.0	57.8	60.7	54.9	41.5	24.3	-1.1	-9.1	22.9
Precipitation .in..	0.82	0.70	0.38	0.57	0.77	0.92	1.85	1.68	1.84	1.11	0.79	1.20	12.6
Dutch Harbor:													
Temperature .°F..	32.7	32.2	32.9	35.2	40.4	46.1	51.2	51.5	47.1	41.6	35.6	32.1	39.9
Precipitation .in..	5.78	6.55	5.75	3.70	5.46	3.38	2.56	3.52	6.83	9.35	8.14	6.55	67.6
Eagle, Fort Egbert:													
Temperature .°F..	-16.4	-4.9	9.4	26.0	45.4	56.3	58.8	52.0	41.0	24.3	2.4	-10.0	23.7
Precipitation .in..	0.48	0.37	0.52	0.43	0.85	1.40	1.99	2.27	1.37	0.90	0.51	0.51	11.7
Fairbanks:													
Temperature .°F..	-16.4	-0.5	11.0	28.4	48.1	59.2	60.8	53.9	42.1	25.2	1.7	-5.8	25.6
Precipitation .in..	0.82	0.30	0.69	0.30	0.49	1.55	1.60	1.90	1.37	0.65	0.91	0.85	11.4

¹ Low March mean due to extremely low readings in that month in 1909 and 1910.

² Three years' record for September, and two years for October and November.

Normal temperature and precipitation—Continued.

Station.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Fort Liscum:													
Temperature °F..	19.6	22.3	26.6	33.9	42.8	50.3	52.8	50.5	45.3	35.6	26.5	23.8	35.8
Precipitation .in..	7.01	5.08	6.00	3.58	4.27	2.45	5.03	7.90	9.29	8.98	5.88	8.70	74.2
Fortmann Salmon Hatchery:													
Temperature °F..	23.6	30.2	34.4	39.9	46.7	53.2	57.0	57.1	51.2	44.4	36.5	32.7	42.2
Precipitation .in..	10.6	10.6	10.8	13.0	8.57	6.02	8.58	8.19	16.9	12.4	20.6	15.9	151.1
Holy Cross:													
Temperature °F..	-4.7	2.2	13.1	23.8	40.7	53.2	55.8	52.0	43.1	27.7	10.8	-3.3	26.2
Precipitation .in..	1.63	1.07	1.54	0.56	0.31	1.45	2.15	3.54	2.68	1.54	1.32	1.78	19.6
Juneau:													
Temperature °F..	26.9	30.0	34.7	41.1	48.4	55.0	57.9	55.6	50.0	43.5	34.8	31.8	42.5
Precipitation .in..	6.30	4.65	4.94	5.01	5.43	3.70	4.90	6.98	10.4	9.72	7.41	6.99	76.5
Knai:													
Temperature °F..	10.3	18.3	24.2	33.9	43.7	49.6	53.6	53.9	46.0	32.4	21.1	12.7	33.3
Precipitation .in..	0.65	1.01	0.83	0.65	0.85	0.92	2.16	3.39	3.06	2.29	2.12	1.02	18.9
Ketchikan:													
Temperature °F..	28.9	34.7	38.1	41.5	49.3	54.3	57.8	56.8	52.5	45.4	37.5	34.6	44.3
Precipitation .in..	13.7	10.5	14.1	14.1	6.35	5.35	12.0	14.2	14.2	24.1	18.9	17.4	164.9
Kitchenstok:													
Temperature °F..	-24.0	-13.2	4.0	20.8	42.9	51.6	53.8	49.8	34.1	22.0	-1.5	-14.8	18.8
Precipitation .in..	0.28	0.13	0.18	0.25	1.13	1.91	2.20	1.83	1.03	1.50	0.40	0.58	11.5
Killsnoo:													
Temperature °F..	27.4	26.9	32.8	37.6	45.8	51.5	55.2	54.4	48.0	41.7	33.8	31.1	40.6
Precipitation .in..	5.04	4.11	3.07	3.01	2.68	2.05	3.39	4.22	6.77	7.57	5.60	5.17	52.7
Klukwan:													
Temperature °F..	10.7	19.7	29.9	38.0	48.0	54.2	57.5	54.9	48.9	38.0	24.6	18.2	36.9
Precipitation .in..	1.34	1.19	1.44	0.64	0.73	0.69	1.66	1.69	3.08	3.42	2.30	2.47	20.1
Kodiak:													
Temperature °F..	29.5	29.9	34.0	36.2	43.7	50.5	54.9	55.0	50.0	41.6	35.1	30.8	41.0
Precipitation .in..	5.12	4.66	4.14	3.83	5.60	4.68	3.42	5.01	5.69	7.37	5.98	8.44	64.0
Kotzebue:													
Temperature °F..	-15.5	-6.6	4.6	9.9	27.3	42.4	54.2	49.2	39.8	22.8	3.4	-7.7	18.6
Nome:													
Temperature °F..	3.3	6.4	6.8	18.0	35.8	46.0	50.9	49.7	41.0	29.3	16.2	7.1	25.9
Precipitation .in..	0.87	0.69	1.13	0.43	0.70	0.85	2.21	2.83	2.10	1.27	0.67	1.07	14.8
Nushagak:													
Temperature °F..	18.8	12.0	21.0	29.4	4.19	52.8	55.5	54.7	46.9	36.2	22.3	12.0	33.6
Precipitation .in..	2.49	1.15	2.47	1.53	2.25	1.76	3.59	4.49	4.82	1.92	2.28	1.20	29.9
Orcas:													
Temperature °F..	27.4	29.2	31.3	39.2	44.8	52.2	58.6	56.0	49.7	40.6	33.1	29.1	40.8
Precipitation .in..	11.3	8.77	7.94	11.7	.....	.....	.....	15.5	16.4	22.3	13.3	13.7	.....
Point Barrow:													
Temperature °F..	-22.2	-14.0	-12.6	-1.5	21.4	35.8	40.4	39.2	32.6	16.0	-1.8	-13.4	10.0
Precipitation .in..	0.13	0.32	0.22	0.31	0.25	0.45	0.93	0.83	0.51	0.70	0.38	0.21	5.25
Rampart:													
Temperature °F..	-20.5	-7.5	5.9	23.2	46.1	59.2	60.8	55.4	40.8	20.5	-1.7	-10.4	22.6
Precipitation .in..	0.60	0.48	0.46	0.26	0.60	1.03	1.31	1.62	1.29	0.81	0.54	0.76	9.78
St. Michael:													
Temperature °F..	6.1	0.7	8.5	18.8	33.0	45.9	53.6	52.0	44.0	30.8	15.7	4.8	26.2
Precipitation .in..	0.84	0.17	0.45	0.45	0.92	1.40	1.62	2.61	2.90	1.19	0.77	0.67	14.0
St. Paul:													
Temperature °F..	24.0	22.2	23.8	27.2	35.0	40.9	45.8	47.0	45.4	40.0	33.9	25.3	34.2
Precipitation .in..	3.25	2.41	2.72	1.98	2.13	1.87	3.37	3.24	3.69	4.27	3.73	3.25	35.9
Seward:													
Temperature °F..	22.2	28.2	32.7	37.1	44.8	50.0	55.7	54.5	49.3	39.7	30.7	26.8	39.3
Precipitation .in..	3.20	5.00	4.00	4.47	3.00	2.44	2.32	6.45	7.04	8.21	6.58	8.37	61.1
Sitka:													
Temperature °F..	31.5	33.3	36.4	41.3	46.5	51.1	54.7	55.5	51.8	45.7	37.9	35.5	43.4
Precipitation .in..	7.42	6.04	5.14	5.52	4.02	3.45	4.15	6.93	9.80	11.4	8.65	8.59	81.1
Skagway:													
Temperature °F..	18.6	23.1	29.8	39.8	49.8	56.0	58.2	55.3	49.6	41.0	31.2	27.8	40.0
Precipitation .in..	1.16	1.38	1.15	1.56	0.66	0.97	1.38	1.57	2.88	4.60	3.50	2.52	23.3
Sunrise:													
Temperature °F..	10.7	20.3	24.8	33.4	43.1	49.8	53.4	51.7	43.7	34.1	22.6	18.0	33.8
Precipitation .in..	2.44	2.70	1.78	2.74	1.95	1.04	2.00	2.98	3.34	4.91	4.61	4.91	35.4
Tanana, Fort Gibbons:													
Temperature °F..	-14.8	-5.0	7.7	23.9	44.9	58.5	59.2	52.8	39.3	21.9	-1.4	-11.4	23.0
Precipitation .in..	0.77	0.62	0.61	0.20	0.95	0.73	2.01	2.42	1.18	1.04	0.79	0.65	11.9
Tyonek:													
Temperature °F..	11.5	18.6	25.3	35.2	45.2	53.4	57.0	58.3	48.9	36.2	25.2	18.5	36.1
Precipitation .in..	1.68	0.98	0.91	0.99	0.46	1.05	2.66	4.41	3.82	3.37	1.27	1.21	22.8
Valdez:													
Temperature °F..	18.7	23.0	26.4	34.0	43.4	51.4	53.7	52.2	47.1	38.8	26.6	22.3	36.5
Precipitation .in..	3.56	5.04	4.63	3.72	2.81	2.16	3.14	5.11	7.64	5.25	2.95	7.51	53.5
Wrangell:													
Temperature °F..	24.0	30.5	31.6	42.7	48.0	55.6	58.2	57.4	51.8	44.8	36.9	31.7	42.8

* Two years' record only for April, May, and June; three years for July.

COMPARISON OF WEATHER DURING SUMMER MONTHS OF 1915
AND 1916.

The amount of sunshine and rainfall for the five summer months of the years 1915 and 1916 is compared from data gathered at 12 stations scattered over the Territory which have reported the weather conditions to the Sitka Station. It will be noticed that there is a striking difference between the number of clear days in 1915 and the number of clear days in 1916. The greater number of sunshiny days in 1915 had, of course, a direct influence on the temperature, making that year much more favorable to agriculture than 1916.

Summer sunshine and rainfall for the years 1915 and 1916.

ALLAKAKAT, KOYUKUK RIVER. Latitude 66° 45'.

Month.	1915			1916		
	Daily mean temperature.	Rainfall.	Clear days.	Daily mean temperature.	Rainfall.	Clear days.
	° F.	Inches.		° F.	Inches.	
May.....	44.4	0.46	17	38.4	0.61	2
June.....	58.2	1.07	13	55.2	.74	7
July.....	61.0	1.14	8	56.6	.87	13
August.....	54.0	2.79	5	50.6	2.12	7
September.....	40.2	3.38	9	40.4	.76	0

FAIRBANKS EXPERIMENT STATION, TANANA VALLEY. Latitude 64° 50'.

May.....	51.4	0	14	46.1	0.95	5
June.....	61.8	1.80	6	59.3	2.16	5
July.....	65.3	1.67	10	60.4	2.31	7
August.....	56.8	3.24	7	56.3	2.72	7
September.....	45.7	3.12	3	44.9	1.42	2

JUNEAU, SOUTHEASTERN ALASKA. Latitude 58° 18'.

May.....	54.2	2.40	20	48.7	4.21	12
June.....	55.8	4.51	11	55.4	5.97	8
July.....	62.7	.25	25	57.5	4.99	7
August.....	51.0	6.83	12	55.8	6.48	8
September.....	46.2	10.34	7	50.8	12.25	5

KETCHIKAN, SOUTHEASTERN ALASKA. Latitude 55° 25'.

May.....	51.9	4.31	17	46.9	8.37	15
June.....	56.2	7.57	15	52.7	6.04	9
July.....	62.2	5.12	20	56.0	10.63	8
August.....	58.9	19.42	9	58.0	7.14	16
September.....	55.2	7.63	11	51.8	13.74	6

KLUKWAN, CHILKOOT RIVER. Latitude 59° 25'.

May.....	53.2	-----	19	49.0	0.46	17
June.....	56.7	0.35	14	57.0	.37	17
July.....	63.8	1.20	19	58.4	1.24	9
August.....	56.6	3.76	10	57.2	.63	15
September.....	51.6	2.64	11	49.6	1.03	10

Summer sunshine and rainfall for the years 1915 and 1916—Continued.

KODIAK, KODIAK ISLAND. Latitude 57° 45'.

Month.	1915			1916		
	Daily mean temperature.	Rainfall.	Clear days.	Daily mean temperature.	Rainfall.	Clear days.
	° F.	Inches.		° F.	Inches.	
May.....	46.6	1.79	13	39.6	6.57	1
June.....	53.4	3.66	8	45.7	6.28	2
July.....	59.0	.58	17	52.2	2.45	9
August.....	55.4	10.32	0	50.8	5.40	4
September.....	53.1	8.59	1	48.4	2.73	4

NOME, BERING SEA. Latitude 64° 30'.

May.....	36.4	0.84	13	31.4	2.52	8
June.....	46.4	1.53	12	44.0	1.21	5
July.....	49.6	3.12	4	51.6	1.49	6
August.....	48.0	1.07	10	49.9	3.02	2
September.....	43.2	3.72	7	43.5	3.15	0

RAMPART EXPERIMENT STATION, YUKON RIVER. Latitude 65° 30'.

May.....	43.8	0.45	16	46.8	0.75	1
June.....	60.2	.67	9	62.2	.91	3
July.....	67.2	1.02	7	63.2	1.07	11
August.....	57.2	1.65	4	.....	1.27	5
September.....	42.8	3.01	4	44.2	1.59	1

SEWARD, RESURRECTION BAY. Latitude 60° 6'.

May.....	51.6	0.10	23	43.4	6.68	7
June.....	55.2	1.71	17	50.0	5.53	5
July.....	63.6	.94	23	55.4	1.21	14
August.....	54.6	12.71	4	53.9	5.97	8
September.....	51.6	9.46	10	47.6	9.54	9

SITKA, BARANOF ISLAND. Latitude 57° 3'.

May.....	53.0	0.85	14	46.1	3.31	13
June.....	54.2	3.55	11	51.0	6.04	5
July.....	59.8	1.27	9	54.2	4.68	7
August.....	58.0	9.17	8	55.8	6.43	7
September.....	53.5	11.94	5	50.0	15.66	4

TANANA, AT MOUTH OF YUKON RIVER. Latitude 65° 13'.

May.....	49.6	0.73	17	44.4	0.86	5
June.....	59.0	1.62	11	57.6	1.03	11
July.....	.....	.....	.....	59.0	1.57	14
August.....	54.4	2.94	8	54.4	2.87	11
September.....	42.2	2.23	9	42.6	1.92	6

VALDEZ, PRINCE WILLIAM SOUND. Latitude 61° 7'.

May.....	46.7	0.62	13	42.6	5.90	6
June.....	51.0	1.85	7	50.6	2.48	5
July.....	58.0	1.16	16	55.5	.88	3
August.....	52.0	4.44	0	50.4	11.69	3
September.....	46.9	5.22	3	44.4	11.20	3

METEOROLOGICAL REPORTS.

The weather conditions in many sections of Alaska are presented in the following pages in a much condensed form, but the facts are nevertheless given in such a manner that anybody who will take the trouble to study them may get a good idea of the climate as recorded at each of the stations named. The figures are based on one daily observation taken at the same hour every day; hence there are as many observations for each month as there are days in the month.

The columns headed "Temperature" contain, first, the maximum, or highest, temperature of the month; next, the minimum, or lowest, temperature which occurred during the month; the third column contains the mean maximum—that is to say, an average of all the maximum temperatures of the month; the fourth column gives the mean minimum, or the average of all the low temperatures, and, finally, in the fifth column is given the daily mean temperature, which is an average of the mean maximum and mean minimum. The total precipitation includes not only the rainfall but also the snowfall, which has been melted and measured as water. The remaining four columns are self-explanatory and easily understood, in that they give for each month the number of days of clear weather, partly cloudy weather, and cloudy weather, and the days on which rain or snow fell. The latitude and the longitude of each station are given, so that the place may be easily located on the map.

Condensed meteorological reports.

ALLAKAKAT. Latitude 66° 45', longitude 151° 10'. Bertha B. Mills, observer.

Month.	Temperature.					Amount of precipitation.	Number of days.			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1916.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	32	-66	-6.4	-29.6	-18.0	1.33	14	4	12	5
February.....	33	-64	-4.6	-32.2	-18.4	.52	14	7	8	1
March.....	35	-61	2.7	-37.2	-17.2	.15	22	3	6	1
April.....	53	-18	35.7	7.7	21.7	.57	11	6	13	4
May.....	67	7	51.6	25.3	38.4	.61	2	12	17	5
June.....	86	27	70.8	39.5	55.2	.74	7	11	12	2
July.....	81	29	73.4	39.7	55.5	.87	13	5	13	4
August.....	81	21	65.2	35.9	50.6	2.12	7	14	10	5
September.....	61	13	51.8	28.9	40.4	.76	.....	19	11	2
October.....	44	-35	30.4	12.3	21.4	2.50	8	11	12	8
November.....	33	-54	2.6	-21.0	-9.2	.....	9	10	11	1
December.....	.....	-69	.....	-39.4	.....	.53	14	5	12	5

ANCHORAGE. Latitude 61° 13.2', longitude 149° 54'. D. D. Vint, observer.

1916.										
February.....	48	-22	25.4	-0.5	12.4	0.98	9	17	3	8
March.....	44	-19	30.5	6.5	18.5	.01	17	12	2	1
April.....	56	20	45.6	27.8	36.7	.00	14	11	5	.....
May.....	60	22	49.7	34.2	42.0	1.65	4	14	13	11
June.....	68	31	57.4	42.6	50.0	.96	3	11	16	10
July.....	71	32	62.7	45.5	54.6	.86	6	17	8	5
August.....	69	33	62.6	45.2	53.9	3.41	3	18	10	18
September.....	64	28	53.9	38.5	46.2	2.54	2	17	11	19
October.....	53	-5	44.1	31.2	37.6	6.43	.....	15	16	18
November.....	49	-13	26.3	9.1	18.0	.99	4	20	6	8
December.....	36	-36	16.0	- .6	7.7	.67	7	5	19	11

Condensed meteorological reports—Continued.

BARROW. Latitude 71° 23', longitude 156° 17". T. L. Richardson, observer.

Month.	Temperature.					Amount of precipitation.	Number of days.			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1915.	°F.	°F.	°F.	°F.	°F.	Inches.				
December.....	18	-39	-14.9	-26.2	-20.6	.....	14	1	16	.....
1916.										
January.....	33	-39	-9	-16.5	-8.7	.....	14	7	10	.....
February.....	25	-44	-8.2	-22.2	-15.2	.....	7	6	16	.....
March.....	15	-38	-12.3	-26.4	-19.4	.....	22	4	5	.....
April.....	34	-25	7.3	-6.2	-6.6	.....	9	6	15	.....
May.....	40	6	29.0	19.7	24.4	.....	8	11	12	.....
August.....	53	28	40.2	31.5	35.8	.....	14	2	15	.....
September.....	44	19	32.5	28.2	30.4	.....	0	2	28	.....
October.....	37	-5	23.5	14.3	18.9	.....	7	4	20	.....
November.....	26	-43	2.2	-7.8	-2.8	.....	6	3	21	.....
December.....	-2	-35	-17.3	-24.5	-20.9	.....	13	8	10	.....

CALDER. Latitude 56° 8', longitude 132° 27'. John McCallum, observer.

1916.										
January.....	35	-8	21.7	10.7	16.2	1.32	23	6	2	5
February.....	47	12	35.8	26.0	30.9	6.15	12	5	12	10
March.....	47	13	37.1	26.7	31.9	9.90	5	10	16	25
April.....	68	28	48.6	34.0	41.3	10.50	4	16	10	21
May.....	76	26	53.1	34.2	43.6	4.40	16	5	10	13
June.....	77	30	58.2	42.7	50.4	4.00	7	11	12	16
July.....	69	38	59.3	44.6	52.0	5.35	4	12	15	19
August.....	79	40	62.1	46.3	54.2	5.38	13	4	14	14
September.....	67	30	55.4	42.0	48.7	6.15	5	9	16	18
October.....	54	27	48.7	36.3	42.5	10.85	8	7	16	20
November.....	50	22	39.8	32.0	35.9	14.75	1	9	20	26
December.....	40	14	33.1	25.0	29.1	12.76	3	13	15	21

CANDLE. Latitude 66°, longitude 161° 50'. R. S. Dimmick, observer.

1915.										
December.....	34	-36	-6.6	-25.0	-15.8	.....	14	5	12	.....
1916.										
January.....	35	-46	14.2	-2.6	5.8	.....	4	.....	27	.....
February.....	34	-32	9.2	-8.4	4	.....	10	.....	19	.....
March.....	26	-32	6.0	-20.3	-7.2	.....	21	2	8	.....
April.....	46	-22	21.4	1.4	11.4	.....	9	3	14	.....
May.....	57	8	40.3	25.6	33.0	1.06	4	1	25	7
June.....	75	26	59.0	39.7	49.4	.96	9	.....	18	6
July.....	82	30	66.9	42.8	54.8	.68	9	3	14	9
August.....	76	24	64.5	41.0	52.8	1.05	3	4	18	.....
September.....	60	24	48.3	35.4	41.8	1.59	6	5	18	17
October.....	43	-2	30.4	19.6	25.0	1.22	15	1	15	.....
November.....	30	-24	13.0	-2.3	5.4	.....	7	1	21	.....
December.....	25	-46	-15.3	-23.2	-19.2	.....	10	.....	21	.....

DUTCH HARBOR. Latitude 53° 54', longitude 166° 33'. Emil Ittner, observer.

1915.										
May.....	58	30	48.5	38.9	43.7	7.06	6	5	20	17
June.....	73	36	54.9	43.5	49.2	1.70	.....	7	23	10
July.....	71	41	58.8	46.5	52.7	1.66	10	7	14	10
August.....	73	40	58.4	43.1	50.8	3.54	7	7	17	16
September.....	68	37	55.3	43.6	49.5	9.69	.....	.....	18	.....
October.....	57	30	47.0	37.7	42.4	6.29	.....	.....	20	.....
November.....	54	22	42.7	30.8	36.8	10.44	1	5	24	26
December.....	48	20	38.2	27.4	32.8	4.76	4	6	21	23
1916.										
January.....	48	17	40.7	30.2	35.4	3.20	6	4	21	12
February.....	43	7	33.8	24.9	29.4	11.48	1	3	25	22
March.....	41	13	32.5	22.5	27.5	1.80	5	6	20	13
April.....	47	22	38.5	27.9	33.2	2.04	8	7	15	11
May.....	55	27	43.5	31.4	37.4	4.26	2	3	26	11
June.....	57	30	47.8	36.6	42.2	1.70	.....	7	23	10
July.....	68	36	54.7	41.2	48.0	1.66	10	7	14	10
August.....	63	39	55.5	43.2	49.3	3.54	7	7	17	16
September.....	62	28	52.2	41.5	46.8	3.54	3	11	16	14
October.....	65	29	47.3	38.3	42.8	12.36	1	6	24	26
November.....	47	23	38.5	30.4	34.4	4.00	.....	.....	.....	.....
December.....	.....	.....	.....	.....	.....	9.12	3	7	21	21

Condensed meteorological reports—Continued.

EAGLE. Latitude 64° 40', longitude 141° 5'. W. G. Myers, observer.

Month.	Temperature.					Amount of pre-cipitation.	Number of days.			
	Maxi-mum.	Mini-mum.	Mean maxi-mum.	Mean mini-mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1916.	° F.	° F.	° F.	° F.	° F.	Inch es.				
January.....	20	-67	- 7.4	-25.9	-16.6	1.08	15	4	12	6
February.....	37	-50	1.4	-20.5	- 9.6	.47	15	5	9	7
March.....	46	-48	9.9	-24.4	- 7.2	.06	12	4	15	1
April.....	66	10	47.4	24.4	35.9	.23	6	13	11	3
May.....	79	21	59.5	33.7	46.6	1.34	3	11	17	10
June.....	89	33	73.2	44.7	59.0	1.92	4	14	12	10
July.....	85	30	73.1	46.1	59.6	1.59	8	12	11	10
August.....	79	26	65.9	40.5	53.2	2.18	5	10	16	13
September.....	74	21	53.3	33.6	43.4	1.86	1	4	25	12
October.....	52	- 1	36.8	24.7	30.8	.96	1	5	25	11
November.....	46	-31	15.3	2.1	8.7	.24	4	3	23	8
December.....	18	-54	- 5.5	-23.2	-14.4	.69	9	4	18	5

AGRICULTURAL EXPERIMENT STATION, FAIRBANKS. Latitude 64° 50', longitude 148° 9'. J. W. Neal, observer.

1916.										
January.....	32	-60	1.8	-17.0	- 7.6	2.22	14	5	12	11
February.....	40	-41	7.4	-14.2	- 3.4	.48	12	12	5	7
March.....	43	-35	18.2	-13.8	2.2	.04	19	10	2	1
April.....	65	12	48.2	24.8	36.5	.28	7	12	11	4
May.....	75	18	58.2	34	46.1	.95	5	19	7	3
June.....	92	36	72.5	46.1	59.3	2.16	5	18	7	15
July.....	85	43	73.7	47	60.4	2.31	7	17	7	12
August.....	83	29	69.4	43.2	56.3	2.72	7	20	4	11
September.....	69	26	55.6	34.2	44.9	1.42	2	16	12	10
October.....	50	-16	31.9	23.3	30.1	1.89	4	11	16	16
November.....	44	-35	12.7	- 4.8	4	.53	8	13	9	7
December.....	21	-50	- 7	-21.9	14.4	.71	12	12	7	10

FORTMANN SALMON HATCHERY. Latitude 55° 20', longitude 131° 40'. Fred Patching, observer.

1916.										
January.....	34	-23	20.9	0.5	10.7	1.94	16	9	6	6
February.....	50	- 7	38.6	22.3	30.4	10.58	4	5	20	17
March.....	51	9	40.4	27.1	33.8	14.08	3	5	23	27
April.....	67	27	50.6	32.6	41.6	12.12	5	6	19	21
May.....	80	27	59.3	35.6	47.4	7.69	11	6	14	19
June.....	87	34	65.6	45	55.3	7.44	9	9	12	21
July.....	83	41	66.7	48.2	57.4	12.36	6	5	20	23
August.....	83	41	69.4	49.1	59.2	7.36	9	8	14	16
September.....	79	36	59.6	45.1	52.4	11.93	5	5	20	22
October.....	66	30	52.1	38.8	45.4	12.53	7	4	20	21
November.....	53	20	41.1	32.5	36.8	18.49	3	1	26	25
December.....	39	6	32.6	24	28.3	10.16	7	1	23	19

HOLY CROSS. Latitude 62° 16', longitude 159° 59'. J. A. Carrigan, observer.

1915.										
December.....	37	-30	1.3	-13.3	- 6	2.34	13	1	17	11
1916.										
January.....	37	-31	16.8	- 1.8	9.3	2.38	11	3	17	9
February.....	39	-35	11.8	- 2.8	4.5	1.71	15	7	7	8
March.....	44	-26	12.9	- 4	4.4	.60	20	4	7	3
May.....	62	14	47.5	31.9	39.7	2.29	-----	11	20	17
June.....	87	31	64.4	45.1	54.8	.96	2	14	14	13
July.....	84	41	69	48.6	58.8	1.44	6	9	16	13

Condensed meteorological reports—Continued.

JUNEAU. Latitude 58° 18', longitude 134° 24'. James Wyllie, observer.

Month.	Temperature.					Amount of precipitation.	Number of days.			
	Maxi- mum.	Mini- mum.	Mean maxi- mum.	Mean mini- mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1916.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	39	-15	22.6	8.9	15.8	0.87	22	6	3	3
February.....	49	9	37.4	26.8	32.1	6.66	12	4	13	14
March.....	48	9	34.0	24.6	29.3	3.28	6	11	14	17
April.....	69	28	51.0	36.1	43.8	4.79	11	8	11	17
May.....	79	30	58.3	39.1	48.7	4.21	12	8	11	15
June.....	87	39	64.2	46.6	55.4	5.97	8	10	12	20
July.....	81	43	66.0	49.0	57.5	4.99	7	8	16	17
August.....	82	43	63.3	48.2	55.8	6.48	8	2	21	21
September.....	77	33	56.8	44.7	50.8	12.25	5	6	19	24
October.....	59	28	50.2	39.4	44.8	14.57	8	3	20	23
November.....	54	22	40.9	33.2	37.1	8.04	4	3	23	21

KETCHIKAN. Latitude 55° 25', longitude 131° 35'. A. P. Craig, observer.

1916.										
January.....	37	-7.5	25.8	10.3	18.0	1.18	20	.....	11	5
February.....	55	5	41.6	26.2	33.9	8.73	11	3	15	11
March.....	49	15	41.0	29.3	35.2	13.72	6	.....	25	25
April.....	64	28	49.4	34.3	41.8	13.64	7	5	18	19
May.....	79	29	57.0	36.8	46.9	8.37	15	1	15	16
June.....	79	35	61.7	43.7	52.7	6.04	9	1	20	16
July.....	81	42	64.3	47.8	56.0	10.63	8	1	22	21
August.....	80	39	67.3	48.7	58.0	7.14	16	1	14	12
September.....	75	35	59.0	44.5	51.8	13.74	5	4	21	22
October.....	63	30	52.5	38.6	45.6	14.49	8	1	22	22
November.....	54	22	43.2	33.4	38.3	20.54	4	2	24	24
December.....	43	13	35.9	26.5	31.2	10.42	8	3	20	18

KLUKWAN. Latitude 59° 25', longitude 130°. Rev. F. R. Falconer, observer.

1916.										
January.....	32	-28	14.7	-6.1	4.3	0.56	23	2	6	3
February.....	47	-13	32.9	12.2	22.6	3.21	13	4	12	11
March.....	54	-17	34.4	11.7	23.0	1.14	15	4	12	10
April.....	70	22	52.4	31.6	42.0	.28	15	3	12	7
May.....	85	26	60.5	37.6	49.0	.46	17	7	7	5
June.....	94	39	67.6	46.5	57.0	.37	17	3	10	5
July.....	83	41	67.3	49.2	58.4	1.24	9	7	15	12
August.....	86	41	66.1	48.3	57.2	.63	15	4	12	13
September.....	74	31	56.7	42.4	49.6	1.03	10	4	16	10
October.....	56	18	47.0	36.1	41.6	1.94	8	5	18	11
November.....	45	4	32.4	21.0	26.7	2.75	6	9	15	16
December.....	41	-20	18.2	4.2	11.2	2.33	12	8	11	17

AGRICULTURAL EXPERIMENT STATION, KODIAK. Latitude 57° 45', longitude 152° 30'. M. D. Snodgrass, observer.

1916.										
January.....	51	7	36.0	21.8	30.4	0.66	12	11	8	1
February.....	45	4	31.6	22.9	28.8	3.47	7	13	9	9
March.....	44	12	33.2	23.3	28.2	3.51	8	11	12	13
April.....	60	26	42.8	32.3	37.6	7.57	9	4	17	15
May.....	55	25	41.2	35.0	39.6	6.57	1	8	22	16
June.....	61	35	50.4	40.9	45.6	6.28	2	12	16	15
July.....	71	39	58.6	45.9	52.2	2.45	9	13	9	11
August.....	68	41	56.2	43.4	50.8	5.40	4	5	22	20
September.....	65	35	55.1	41.6	48.4	2.73	4	21	5	12
October.....	56	26	47.6	38.3	43.0	7.69	1	15	15	19
November.....	45	4	36.5	28.5	32.5	5.65	6	12	12	13
December.....	40	-9	29.5	20.4	25.0	4.62	9	8	14	15

Condensed meteorological reports—Continued.

NOME. Latitude 64° 33', longitude 165° 21'. Mrs. Bertha Grantham, observer.

Month.	Temperature.					Amount of precipitation.	Number of days.			
	Maxi-mum.	Mini-mum.	Mean maxi-mum.	Mean mini-mum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1916.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....		-25		4.5		1.81	9	3	19	11
February.....	33	-29	13.8	-1.6	6.1	1.28	15	1	13	9
March.....	26	-26	9.8	-9.0	.4	.46	23	3	5	3
April.....	38	-10	25.5	10.9	18.2	1.50	15	1	14	10
May.....	49	6	37.0	25.9	31.4	2.16	8	4	19	13
June.....	67	27	50.5	37.4	44.0	1.24	5	5	20	12
July.....	68	32	58.9	44.2	51.6	1.49	6	14	11	14
August.....	68	28	56.6	43.2	49.9	3.02	2	8	21	17
September.....	54	39	49.3	37.7	43.5	3.15		12	18	20
October.....	46	12	39.2	39.1	34.6	3.36	4	11	16	18
November.....	38	-20	22.5	6.7	14.6	.20	7	5	18	4
December.....	30	32	0.4	-13.5	-6.6	.08	18	4	9	1

AGRICULTURAL EXPERIMENT STATION, RAMPART. Latitude 65° 30', longitude 159° 15'.
G. W. Gasser, observer.

1916.										
January.....	32	-61	-2.4	-19.9	-11.2	0.58	13	2	16	9
February.....	30	-50	.7	-24.1	-11.7	.79	11	5	13	7
March.....	52	-43	14.4	-20.4	- 3.0		18	10	3	
April.....	73	12	52.4	22.9	37.6	.11	9	11	10	3
May.....	85	22	60.0	33.6	46.8	.75	1	11	19	8
June.....	97	34	78.6	45.9	62.2	.91	3	17	10	5
July.....	88	39	77.8	48.7	63.2	1.07	11	10	10	9
August.....						1.27	5	20	6	13
September.....	72	22	53.3	35.0	41.2	1.59	1	7	22	8
October.....	50	-21	33.3	21.0	27.2	2.88	6	2	23	14
November.....	33	-42	5.3	- 9.6	- 2.2	.40	6	5	19	4
December.....	9	-61	-17.2	-28.7	-23.0	1.27	9	3	19	12

ST. PAUL. Latitude 57° 7' 23'', longitude 170° 16' 23''. Operator in charge, naval radio station observer.

1915.										
September.....	59	35	51.9	42.6	47.3	4.42				22
October.....	54	27	44.5	34.6	39.6	4.16				23
November.....	50	20	40.5	28.9	34.7	3.17				24
December.....	48	19	37.5	27.5	32.5	1.64				24
1916.										
January.....	48	15	38.9	29.1	34.0	.96				12
February.....	42	- 3	31.8	17.7	24.8	1.42				17
March.....	39	- 1	24.0	8.6	16.3	.29				11
April.....	42	- 1	31.6	17.8	24.7	1.40				16
May.....	44	20	38.4	25.7	32.1	1.93				15
June.....	56	26	45.3	31.6	38.4	.64				6
July.....	61	29	51.4	35.5	43.4	1.36				14

SEWARD. Latitude 60° 6', longitude 149° 26'. W. A. McNeiley, observer.

1916.										
January.....	46	- 6	25.6	14.3	20.0	0.32	28	1	2	1
February.....	43	- 2	31.5	18.2	24.8	7.66	16	4	9	12
April.....	72	24	48.4	33.2	40.8	3.44	11	10	9	7
May.....	63	29	49.7	37.1	43.4	6.68	7	11	13	18
June.....	68	38	55.7	44.3	50.0	5.53	5	10	15	17
July.....	78	45	61.4	49.4	55.4	1.21	14	6	11	13
August.....	78	41	60.4	47.4	53.9	5.97	8	1	22	19
September.....	70	32	54.4	40.9	47.6	9.54	9	9	12	19
October.....	53	25	45.3	36.5	40.9	14.13	9	3	19	23

Condensed meteorological reports—Continued.

SHRIMP BAY. Latitude 55° 43', longitude 131° 22'. Sam C. Orchard, observer.

Month.	Temperature.					Amount of precipitation.	Number of days.			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1916.	°F.	°F.	°F.	°F.	°F.	Inches.				
May.....	80	29	57.9	36.8	47.4	3.82	14	6	11	13
June.....	88	37	64.7	46.3	55.5	5.20	10	6	14	17
July.....	81	43	65.1	48.8	57.0	9.33	7	12	12	18
August.....	84	42	67.2	50.5	58.8	4.78	11	6	14	11
September.....	71	37	54.9	45.5	50.2	11.48	5	6	19	16
October.....	54	32	47.6	38.2	42.9	11.34	5	9	17	21
November.....	46	22	39.1	32.3	35.7	12.10	2	6	22	23
December.....	37	9	31.1	24.4	27.8	5.07	8	7	16	12

SHUNGNAK. Latitude 67° 2', longitude 155° 5'. Fred M. Sickler, observer.

1915.										
November.....	24	-43	8.9	-9.1	-0.5	2.01	5	12	13	9
December.....	35	-50	-10.4	-33.5	-22.0	.97	16	11	4	6
1916.										
January.....	41	-61	3.3	-14.3	-5.5	1.56	6	11	14	16
February.....	36	-53	4.2	-15.5	-5.7	.87	13	11	5	8
March.....	34	-53	0.1	-30.8	-15.4	.95	19	10	2	6
April.....	50	-26	23.5	2.6	13.0	.29	2	12	16	11
May.....	63	5	47.3	28.0	37.6	2.06	3	10	18	19
June.....	90	32	69.9	44.3	57.1	.89	4	23	3	13
July.....	87	35	71.7	50.3	61.0	1.22	3	23	5	12
August.....	80	27	64.5	42.6	53.6	3.16	5	10	16	14
September.....	62	25	50.9	35.3	43.1	1.39	2	11	17	15
October.....	45	-23	30.0	18.3	24.2	2.67	2	8	21	19
November.....	24	-43	8.3	-9.1	-.4	2.01	5	12	13	9
December.....	35	-20	10.4	-33.7	-11.7	.97	16	11	4	6

SITKA. Latitude 57° 3', longitude 135° 23'. C. C. Georgeson, observer.

1916.										
January.....	50	-4	30.8	16.2	23.5	1.01	23	3	5	6
February.....	55	16	42.7	27.8	35.2	5.72	7	4	18	15
March.....	53	13	39.6	28.0	33.8	3.66	7	8	16	15
April.....	70	28	51.4	35.4	43.4	4.36	7	6	17	18
May.....	74	28	54.3	37.9	46.1	3.31	13	4	14	16
June.....	78	34	57.7	44.4	51.0	6.04	5	10	15	19
July.....	70	42	60.6	47.8	54.2	4.68	7	2	22	19
August.....	71	42	60.2	51.3	55.8	6.43	7	4	20	17
September.....	68	35	54.2	46.3	50.2	15.66	4	4	22	24
October.....	62	33	52.6	41.2	46.9	17.91	4	9	18	24
November.....	55	24	44.6	34.4	39.5	8.49	1	7	22	24
December.....	47	18	38.0	28.6	33.3	6.97	2	8	21	21

SULZER. Latitude 55° 16', longitude 132° 42'. Vivian V. Walters, observer.

1916.										
January.....	39	-5	25.2	12.6	18.9	2.59	24	5	2	7
February.....	50	7	44.2	26.9	35.6	8.72	15	4	10	17
March.....	56	17	46.1	30.7	38.4	10.06	8	8	15	25
April.....		30		35.5		11.30	11	4	15	20
May.....						5.43	14	5	12	15
June.....		44		57.0		3.58	13	5	12	14
July.....		42		50.6		3.92	13	6	12	19
August.....	82	39	67.1	50.0	58.6	3.44	14	5	12	13
September.....	77	36	58.4	46.0	52.2	8.97	7	14	9	21
October.....	60	31	52.1	40.2	46.2	11.65	9	5	17	23
November.....	53	24	42.9	34.0	38.4	22.42	7	3	20	23
December.....	44	14	35.4	27.8	31.6	11.12	11	7	13	21

Condensed meteorological reports—Continued.

TANANA. Latitude 65° 13', longitude 152° 15'. E. Stolze, observer.

Month.	Temperature.					Amount of precipitation.	Number of days.			
	Maximum.	Minimum.	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
1916.	° F.	° F.	° F.	° F.	° F.	Inches.				
January.....	30	-65	1.0	-17.6	- 8.3	0.97	16	.....	17	10
February.....	35	-54	-1.4	-20.8	-11.1	.71	15	.....	14	7
March.....	39	-42	7.1	-16.6	- 4.8	.03	16	.....	17	1
April.....	60	8.5	42.0	23.5	32.8	.27	6	8	16	7
May.....	72	18	54.3	34.5	44.4	.86	5	10	16	9
June.....	89	30	70.8	44.3	57.6	1.03	11	7	12	6
July.....	83	32.5	73.4	44.7	59.0	1.57	14	9	8	10
August.....	84	22	67.3	41.4	54.4	2.87	11	6	14	18
September.....	66	18	52.4	32.7	42.6	1.92	6	7	17	20
October.....	48.5	-20	32.2	19.3	25.8	3.90	8	1	22	18
November.....	34	-42	5.7	- 9.9	- 2.1	1.33	14	2	14	13

THANE. Latitude 58° 17', longitude 134° 16'. H. D. McClellan, observer.

1916.										
January.....						0.60	25	3	3	2
February.....						5.64	11	2	16	12
March.....	42	-10	21.2	12.1	16.6	13.27	3	3	25	14
April.....	77	18	40.7	28.4	34.6	4.50	10	2	18	10
May.....	86	22	50.8	32.0	41.4	1.88	15	3	13	8
June.....		30		39.5		9.29	8	4	18	20
July.....	72	36	54.4	42.3	48.4	6.84	9	4	18	20
August.....	72	36	51.7	43.1	47.4	10.11	11	.....	20	20
September.....	64	28	42.5	35.4	38.9	12.57	5	3	22	17
October.....	54	20	37.6	31.8	34.7	19.88	7	2	22	23
November.....	42	8	28.7	22.9	25.8	11.57	4	2	24	16

VALDEZ. Latitude 61° 7', longitude 146° 20'. Mrs. Laura Jones, observer.

1916.										
January.....	50	-18	20.2	2.2	11.2	0.68	19	7	5	3
February.....	48	- 6	27.9	11.7	19.8	5.83	13	6	10	14
March.....	50	- 1	27.5	12.8	20.2	.90	15	6	10	4
April.....	60	15	45.1	26.6	35.8	2.33	7	11	12	11
May.....	64	25	50.7	34.6	42.6	5.90	6	5	20	18
June.....	73	33	59.0	42.3	50.6	2.48	5	7	18	17
July.....	69	39	63.8	46.2	55.0	.88	3	14	14	7
August.....	69	33	58.0	42.9	50.4	11.69	3	6	22	19
September.....	59	30	50.3	38.6	44.4	11.20	3	10	17	24
October.....	52	24	43.4	34.3	38.8	12.85	6	1	24	24
November.....	40	- 3	30.0	20.3	25.2	8.33	15	3	12	14
December.....	36	-10	22.7	10.0	16.4	3.91	15	5	11	9

